DOCUMENT RESUME

ED 405 807 IR 018 247

AUTHOR	Smith, Peter, Ed.
TITLE	Association of Small Computer Users in Education (ASCUE) Summer Conference Proceedings (29th, North Myrtle Beach, South Carolina, June 9-13, 1996).
INSTITUTION	Association of Small Computer Users in Education.
PUB DATE	96
NOTE	235p.; For individual papers, see IR 018 248-279. For 1995 proceedings, see ED 387 088.
PUB TYPE	Collected Works - Conference Proceedings (021)
EDRS PRICE	MF01/PC10 Plus Postage.
DESCRIPTORS	Computer Assisted Instruction; Computer Networks; *Computer Uses in Education; *Educational Technology; Futures (of Society); Higher Education; Information Networks; Internet; *Microcomputers; *Multimedia Instruction; Teacher Education; Technological Advancement; Telecommunications

ABSTRACT

Papers from a conference on small college computing issues are: "Ethics, Privacy, and Security in Higher Education Technology" (John A. Anderson); "Multimedia in the Classroom: Recollections After Two Years" (Stephen T. Anderson Sr.); "Creating a Computer Competency Requirement for Mary Washington College Students" (David J. Ayersman, Ernest C. Ackermann, and Paul M. Zisman); "Low Cost, Low Tech, Low Brow Technology: A Plan for Campus Communication" (Kurt E. Bernardo); "Back to the Future: Help! It Was 20 Years Ago, and We've Only Just Arrived" (Kate Coffield); "Starting Computer Science Using C++ with Objects: Workable Approach" (Mary V. Connolly); "Web Database Development: Implications for Academic Publishing" (Bob Fernekes); "Using a Computer Program To Enhance an English Course in the Novel" (David Field); "A Team Approach To Managing Technology: Despite Our Differences--We Had To Make IT Work!" (Peter R. Giuliani); "Integrating "Geometer's Sketchpad" into a Geometry Course for Secondary Education Mathematic Majors" (Margaret W. Groman); "1 Thirty Station Math Lab + 2 Faculty = Managing 500 Students Successfully in Low-Level Mathematics Courses" (Tim Hagopian); "The WWW, Preservice Teachers and their Mathematics Courses" (Pat Halpin and Joanne D. Kossegi); "MSCD's Development of a Campus Wide Information System on the World Wide Web" (Mary Hanna); "The Just in Time Approach To Effectively Use Business Software in College Business Courses" (Brian R. Hoyt); "C-CUE: A Regional Consortium in Action" (Frederick Jenny, Daniel Faulk, and William J. Creighton); "Creating an Undergraduate InfoTech Major" (Harold H. Kollmeier); "Process and Facilities as Critical Success Factors in Training and Supporting Faculty To Use Multimedia/Computer Technologies" (Michael E. Kress and Arthur W. Hafner); "Project Vision: An On-Line Learning Initiative for College Freshmen" (Susan V. Monk); "Distance Learning and Today's Educational Environment" (Thomas A. Pollack); "The Computerized 'Assistant Prof'" (J. Stuart Shough); "Developing a CWIS--It's Not a Computing Center Project" (Carol L. Smith and Bonnie M. Nealon); "The Shift to a Learner-Centered University: New Roles for Faculty, Students, and Technology" (Karen L. Smith and J. Timothy Kolosick); "A Process Education Approach To Teaching Computer Science" (Peter D. Smith); "The Paperless Writing Course: A Relevant Business Writing Course"

(Michelle Snyder); "Neural Networks for the Beginner" (Robin M. Snyder); "A Personal Multimedia System for Instructional Support" (Robin M. Snyder); "Bridging the Multimedia Generation Gap" (Nancy Thibeault and Janet Hurn); "Using TQM: A New Teaching Model" (Nancy S. Thomson); "Faculty as Partners: A Four-Tiered Training Approach To the Web" (Robin Wagner and Kim Breighner); "Supporting Student PCs on the Campus Network" (Brad Weaver); "The Compressed Video Experience" (John Weber); and "Integrating Courses with the Internet: Preparing the Teacher as well as the Learner" (Arthur E. Williams). (SWC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 405 807

ASCUE

ASSOCIATION OF SMALL COMPUTER USERS IN EDUCATION

"Our Second Quarter Century of Resource Sharing"

Proceedings of the 1996 ASCUE Summer Conference

29th Annual Conference
June 9 - 13, 1996

North Myrtle Beach, South Carolina

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

C.P. Singer

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Edited by Peter Smith, Saint Mary's College

BEST COPY AVAILABLE

IR018247

ASSOCIATION OF SMALL COMPUTER USERS IN EDUCATION

"Our Second Quarter Century of Resource Sharing"

Proceedings of the 1996 ASCUE Summer Conference

29th Annual Conference
June 9 - 13, 1996

North Myrtle Beach, South Carolina

Edited by Peter Smith, Saint Mary's College

Corrections to the Proceedings

Albert LeDuc, our keynote speaker, was forced to withdraw at the last minute for personal reasons. We were fortunate that Mike Zastrocky agreed to give the keynote on short notice. Those of you who attended last year's conference will remember his excellent workshop and keynote address.

Keynote Speaker

Michael Zastrocky, B.S., M.A., Ed.D., Research Director, Academic Strategies for Gartner Group received his degrees from Regis University, the University of Denver, and the University of Northern Colorado in Mathematics, Education Administration, and Technology and Mathematics Education. Dr. Zastrocky has provided extensive consultation over the past 25 years to colleges, universities, and companies in the computing and information technology field. He has written or co-authored seven books, sixteen modules, and numerous articles on computing, mathematics, and management issues. Prior to assuming his current position in 1996, he served as Vice President of the Kaludis Consulting Group from 1995-1996, and Vice President of CAUSE, the association for managing and using information resources in higher education from 1989-1994, where he was responsible for updating, expanding, and disseminating information available through CAUSE as well as through external sources. He also served as Assistant Dean of the College, Director of Information Services, and Graduate MBA Professor at Regis University. He has led numerous workshops and seminars on technology including presentations for the NACUBO Executive Strategies Series, and has served as a keynote speaker for international, national, and regional meetings and conferences.

Pre-conference Workshops I and II Assistant Facilitator

Leon Daniel has been the senior computing and networking technologies administrator on four college and university campuses for the past seventeen years, and 22 out of the past 28 years. He currently serves as Associate Vice President for Information Technology at Metropolitan State College of Denver. Mr. Daniel holds a Master of Computing Sciences degree from Texas A&M University, and has attended numerous workshops and seminars in planning, networking and evolving computer technologies. His work efforts have included developing long range plans for information technology at three colleges and universities, including current planning efforts to evolve Metropolitan State College of Denver from a traditional mainframe architecture to a network-based, client/server architecture for both academic and administrative computing technology.

Special Request

Those who intend to attend Peter Smith's presentation on Monday, 10:00-10:45, in Water Oak's III are asked to read through his paper on pages 158-167 in the Proceedings prior to the presentation. Please pay particular attention to the Appendix on pages 166-167. The audience will participate in a process education activity.

Association of Small Computer Users in Education
"Our Second Quarter Century of Resource Sharing"

Proceedings of the 1996 ASCUE Summer Conference
29th Annual conference
June 8-13, 1996
Myrtle Beach, South Carolina

ABOUT ASCUE

ASCUE, the Association of Small Computer Users in Education, is a group of people interested in small college computing issues. It is a blend of people from all over the country who use computers in their teaching, academic support, and administrative support functions. Begun in 1968 as CUETUG, The College and University Eleven Thirty User's Group, with an initial membership requirement of sharing at least one piece of software each year with other members, ASCUE has a strong tradition of bringing its members together to pool their resources to help each other. It no longer requires its members to share homegrown softwatre, nor does it have ties to a particular hardware platform. However, ASCUE continues the tradition of sharing through its national conference held every year in June, its conference proceedings, and its newsletter. ASCUE proudly affirms this tradition in its motto "Our Second Quarter Century of Resource Sharing."

ASCUE's ASCUE-L LISTSERVER

Subscribe by sending the E-mail message SUBSCRIBE ASCUE-L yourname to listserv@gettysburg.edu. The listserv itself is ascue-l@gettysburg.edu. In order to stop the flooding of the listserv with unwanted solicitations, we have set it up so that you will have to send messages from the address you subscribed from.

NEED MORE INFORMATION?

Direct questions about the contents of the 1996 Conference to Carl Singer, Program Chair, ASCUE '96, Computer Center, Depauw University, Greencastle, IN 46135, 317-658-4294, singer@depauw.edu.

"We hereby grant ERIC non-exclusive permission to reproduce this document."

Association of Small Computer Users in Education

ASCUE 1995-1996 Board Members

(years remaining in office)

PRESIDENT
Paul Tabor (1 year)
Biology Department
Clarke College
1550 Clarke Drive
Dubuque, IA 52001
319-588-6526
ptabor@keller.clarke.edu

PAST PRESIDENT
Mary Connolly (1 year)
Mathematics Department
Saint Mary's College
Notre Dame, IN 46556
219-284-4497
connolly@saintmarys.edu

PROGRAM CHAIR
Carl Singer (1 year)
Computer Center
Depauw University
Greencastle, IN 46135
317-658-4294
singer@depauw.edu

TREASURER
Thomas Pollack (1 year)
School of Business Administration
Duquesne University
706 Rockwell Hall
Pittsburgh, PA 15282
412-396-1639
pollack@duq2.cc.duq.edu

SECRETARY
Dagrun Bennett (2 years)
Computing Services
Franklin College
Franklin, IN 46131
317-738-8150
bennett@franklincoll.edu

NEWSLETTER EDITOR
Peter Smith (1 year)
Saint Mary's College
Notre Dame, IN 46556
219-284-4493
psmith@saintmarys.edu

LIBRARY/HISTORIAN
Jack Cundiff (1 year)
Horry-Georgetown Technical College
Box 1966
Conway, SC 29526
803-347-3186
cundiffj@hgtc.hor.tec.sc.edu

BOARD MEMBER AT LARGE
Thomas E. Gusler (1 year)
Associate Provost for Administration
103 Carrier Hall
Clarion University
Clarion, PA 16214
814-226-2676
tgusler@vaxa.clarion.edu

BOARD MEMBER AT LARGE
F.P.(Rick) Huston III (2 years)
University of South Carolina - Aiken
171 University Parkway
Aiken, SC 29801
803-648-6851
rickh@aiken.scarolina.edu

Table of Contents

About ASCUE 1

ASCUE-L Listserver 1

Need More Information? 1

Board Members 2

Keynote Speaker 7
Albert L. LeDuc

Pre-conference Workshops 7
Mike Zastrocky
Morris Weinstock
William Wilson & Martha Arterberry
Stephen Anderson

Ethics, Privacy, and Security in Higher Education Technology 10
John A. Anderson
Loras College

Multimedia in the Classroom: Recollections After Two Years 18
Stephen T. Anderson Sr.
University of South Carolina Sumter

Creating a Computer Competency Requirement for Mary Washington College Students 24
David J. Ayersman
Ernest C. Ackermann
Paul M. Zisman
Mary Washington College

Low Cost, Low Tech, Low Brow Technology: A Plan for Campus Communication 31
Kurt E. Bernardo
Lake Erie College

Back To the Future: Help! It Was 20 Years Ago, and We've Only Just Arrived 34
Kate Coffield
American University in Cairo

Starting Computer Science Using C++ with Objects: Workable Approach 41
Mary V. Connolly
Saint Mary's College

Web Database Development: Implications for Academic Publishing 45
Bob Fernekes
University of South Carolina - Aiken

Using a Computer Program to Enhance an English Course in the Novel 49
David Field
DePauw University

A Team Approach to Managing Technology:
Despite Our Differences - We Had To Make IT Work! 53
Peter R. Giuliani
Franklin University

Integrating *Geometer's Sketchpad* into a Geometry Course for
Secondary Education Mathematics Majors 61
Margaret W. Groman
State University of New York, College at Oswego

1 Thirty Station Math Lab + 2 Faculty =Managing 500 Students Successfully in
Low-Level Mathematics Courses 66
Tim Hagopian
Worcester State College

The WWW, Preservice Teachers and their Mathematics Courses 76
Pat Halpin
Joanne D. Kossegi
State University of New York- Oswego

MSCD's Development of a Campus Wide Information System on the World Wide Web . 82
Mary Hanna
Metropolitan State College of Denver

The Just in Time Approach to Effectively Use Business Software in
College Business Courses 88
Brian R. Hoyt
Ohio University-Lancaster

C-CUE: A Regional Consortium in Action 100
Frederick Jenny
Grove City College
Daniel Faulk
Washington and Jefferson College
William J. Creighton
Indiana University of PA

Creating an Undergraduate InfoTech Major 106
Harold H. Kollmeier
Franklin Pierce College

Process and Facilities as Critical Success Factors in Training and Supporting Faculty to Use Multimedia/Computer Technologies 110
Michael E. Kress
Arthur W. Hafner
College of Staten Island
City University of New York

Project Vision: An On-line Learning Initiative for College Freshmen 114
Susan V. Monk
Penn State Berks

Distance Learning and Today's Educational Environment 124
Dr. Thomas A. Pollack
Duquesne University

The Computerized "Assistant Prof" 131
J. Stuart Shough
University of South Carolina at Spartanburg

Developing a CWIS -- It's not a Computing Center Project 136
Carol L. Smith
Bonnie M. Nealon
DePauw University

The Shift to a Learner-Centered University: New Roles for Faculty, Students, and Technology 146
Karen L. Smith
J.Timothy Kolosick
The University of Arizona

A Process Education Approach to Teaching Computer Science 158
Peter D. Smith
Saint Mary's College

The Paperless Writing Course: A Relevant Business Writing Course 168
Michelle Snyder
Lord Fairfax Community College

Neural Networks for the Beginner 174
Robin M. Snyder
Shenandoah University

A Personal Multimedia System for Instructional Support 181
Robin M. Snyder
Shenandoah University

Bridging the Multimedia Generation Gap 191
Nancy Thibeault
Janet Hurn
Miami University

Using TQM: A New Teaching Model 197
Nancy S. Thomson
Northwest Missouri State University

Faculty as Partners: a Four Tiered Training Approach to the Web 204
Robin Wagner
Kim Breighner
Gettysburg College

Supporting Student PCs on the Campus Network 209
Brad Weaver
Wabash College

The Compressed Video Experience 217
John Weber
Southern Arkansas University

Integrating Courses with The Internet
Preparing the Teacher as well as the Learner 223
Arthur E. Williams
University of Maine at Machias

Presenters Index 231

Keynote Speaker

Albert L. LeDuc is director of computer services at Miami-Dade Community College. In this capacity, he directs the activity of a staff which supports computing and networking needs throughout a five-campus system. He has served as project manager of the Indiana University Management Information System and has held several management positions with private industry and federal government contract projects at locations in Florida and New Jersey. His first professional employment was with the Army Rocket-Guided Missile Agency, Redstone Arsenal, Alabama. He is currently on the Board of CAUSE, the association for the management of information resources in higher education and serves as the president of the Florida Association of Educational Data Systems. He has received the 1993 CAUSE ELITE award for lifetime achievement in Exemplary Leadership and Information Technology Excellence, the 1985 Frank Martin Service Award from the College and University Computer Users Association (CUMREC), and the 1986 CAUSE/EFFECT Contributor of the Year Award. He is an invited speaker at many conferences and an author of numerous articles and papers. His particular field of expertise lies in the management and supervision of technical personnel. LeDuc holds a BA and an MS in mathematics from Florida State University.

Pre-conference Workshops

Pre-conference Workshops I and II
Management Issues for Computing Professionals and Others in Higher Education.

Presented by:
Mike Zastrocky, Research Director/Academic Strategies Gartner Group and
Albert LeDuc, Miami-Dade Community College.

These all-day workshops are an expansion of the popular workshop given by Mike Zastrocky on Managing Information Resources in Higher Education at ASCUE '95. This year Mike will team with the ASCUE keynoter, Al LeDuc to present workshops for those interested in management at beginning or advanced levels. Each workshop will be offered in a seminar style using a highly interactive format. The goal is to supply participants with a framework for understanding broad management issues that apply specifically to higher education environments.

Management Workshop I: Management Issues for the beginner. Topics include, principles of motivation of technical employees in higher education settings, the rationale behind and ways of developing effective communication skills, leadership tools for the special needs of the first-line and new supervisor, managing one's career in today's environment, including an overview of professional development opportunities.

Management Workshop II: Advanced Management Issues. Topics include, strategic, tactical, and project planning techniques, issues of employee empowerment and the establishment of teamwork principles, training issues, especially as applied to today's users and staff development, methods and techniques for stress management.

About the Presenter:
Mike Zastrocky has provided extensive consultation over the past 25 years to colleges, universities, and companies in the computing and information technology field. Prior to assuming his current position in 1996, he served as Vice-President of the Kaludis Consulting Group from 1995-1996, Vice-President of CAUSE from 1989-1994, and Assistant Dean, Director of Information Services, and MBA Professor at Regis University. He has led numerous workshops and seminars on technology including presentations for the NACUBO Executive Strategies Series.

Pre-conference Workshop III
Effective Ways to Develop Instructional Software.

Presented by:
Morris Weinstock, The Pennsylvania State University, University Park

Instructional software development has become more common in higher education because of recent advances in multimedia capabilities. However, this software may or may not have a significant impact on instruction if it isn't used appropriately or thoughtfully.

This workshop will cover methodologies for design and development of courseware; why locally accessed courseware is sometimes preferable to using the World Wide Web; success and failure stories in developing instructional software; implementation issues such as networking, classroom hardware and software requirements, faculty development, student training, copyright issues, faculty programmers vs. central computing vs. outside consultants, as well as, when to buy and when to develop courseware. In addition, some hands on experience developing applications using the new cross-platform package from Oracle, Oracle Media Objects, will be given.

About the Presenter:
Morris Weinstock gave a well-received workshop on MultiMedia Toolbook at last year's ASCUE conference. His primary activity at Penn State is to provide programming support for instructional software and he has been involved with several award winning packages. He also has a breadth of knowledge and background that will contribute especially well to this year's workshop.

Pre-Conference Workshop IV
Bringing the Internet to the Classroom: Options for Faculty and Innocent Bystanders.

Presented by:
William Wilson, Martha Arterberry, Gettysburg College

From questions about infrastructure, technology, and software to concerns about content, the Internet can be intimidating for faculty to contemplate. Is it worth taking the plunge? What does it mean to take the plunge? Intended for faculty and those who support them, this workshop will consider ways that networks can be used to enrich and expand instructional opportunities. A variety of network tools, classroom-tested scenarios, and information-rich internet sites will be examined. Support issues will be discussed and some web training provided.

For faculty thinking about using network resources in instruction, this workshop is for you. If you already use the Internet but are looking for other models and examples of instructional uses, that will be covered too. Time will be set aside for hands-on lab exploration of the net and a chance to design a net resource or classroom assignment.

About the Presenters:
Bill Wilson has given many Internet related workshops at ASCUE which have always been well attended. He has a wealth of experience in this area both from his work at Gettysburg and from several consulting engagements. This year he is joined by his wife and colleague, Martha Arterberry from the Department of Psychology at Gettysburg College. Martha has used the Internet extensively in her classes and will be sharing her experiences during the workshop.

Pre-conference Workshop V
Multimedia Development for the Classroom, Using Astound 2.0.

Presented by:
Stephen T. Anderson Sr., Associate Professor, University of South Carolina Sumter.

This hands-on workshop will show you how to convert lectures, study guides, tutorial materials, or other presentation ideas into an electronic format for use in or outside the traditional classroom. Material can be converted by packages such as Astound, Persuasion, or Powerpoint.

Ideas will be illustrated with the cross-platform presentation package Astound 2.0, due to its ease of use in embedding multimedia and text oriented material into presentations. Hyperlinks, between and within slides, will be used to achieve non-linear presentations resulting is greater control over branching from slide to slide. Hyperlinks can also be used to launch multimedia events (such as a movie!) or programs such as spreadsheets or word processors. Special features like animated graphs and pictographs will be covered as time permits.

Hardware requirements, including peripherals such as scanners, video capture boards, CD-ROM and sound cards will be discussed. Projection equipment needs and problems associated with room lighting, color choices, keeping resources while changing computers, etc. will also be considered.

About the Presenter:
Steve Anderson has been heavily involved in multimedia since 1992, after attending a similar ASCUE workshop. He adopted Astound as the primary vehicle for his teaching and research interests in multimedia applications. He has presented many papers at ASCUE and HENA which emphasized multimedia software as a tool for teaching/learning as well as for presentation purposes.

Ethics, Privacy, and Security in Higher Education Technology

John A. Anderson
Director of Information Services
Loras College
Dubuque, IA 52001
hawks@lcac1.loras.edu

You read about it every day. Technology progress continues at a frightening pace and more and more of our society seem to be dedicated to negate all of the positive aspects that technology brings to improve our life styles. For many years now, the computer has been blamed for most headaches and mistakes that are by-products of the computerization of America. Let's face it, some people just love to hate technology. For years, technology professionals have explained that computers can only do what they are programmed to do, but in spite of this effort, the reputation has developed that all technology is unpredictable, insecure, and unreliable and therefore is just one more thing to avoid.

Technology has both benefits and drawbacks, but it must remain clear that computers are only the tools, and the way that society utilizes these devices is the actual source of the problems. The computer has done nothing more than create new versions of old moral issues like honesty, right and wrong, responsibility, confidentiality, fairness, and loyalty. The misuse of computers by humans only adds fuel to the flames. This misuse comes in many flavors and includes:

- unauthorized access
- theft of money, software, information, etc.
- disputed rights to data and products
- use of computers for fraud
- hacking and virus creation
- degradation of work

Many of these are criminal behavior and some are ethical issues, but regardless of their classification they are tremendous problems for technology professionals in institutions of higher learning. These problems do not stop with data, but have expanded into the voice and video areas. In some cases, higher education institutions are being blamed for providing the know-how and the facilities that are the heart of improper use of technology.

Our responsibility in Information Technology is to encourage constructive creativity, promote freedom of speech, support research and investigation, and provide information access globally, while demonstrating proper use and protection of the data that we are placed in charge of. The speed with which the technology field has progressed on college campuses and the general lack of understanding surrounding most technology has created a monster with more power than any college administrator could ever believe. Information Technology personnel, however, have all this power that they never really asked for. Unfortunately they are technical people and are not sociologists or guidance counselors that they are being asked to be. They deal with security and privacy issues from a technical standpoint and are not sufficiently trained to deal with them and their social ramifications

from a non-technical viewpoint. To complicate matters worse, high tech codes of ethics and laws are basically non-existent and current laws are both outdated and confusing since they were not written to deal with the technologies of today.

As an Administrative Computing director at my institution for the last 18 years, I have read and observed wave after wave of security problems on computer systems and networks. Not being connected to a campus-wide network or to the academic computer system has provided me the luxury of sitting back and being an observer rather than a worrier. Of course we had one dial-up modem that was a worry, but I could just unplug it when the stress builds up and plug it back in when I regained courage. Now they tell me that I should attach my fairly secure system to the campus-wide network, and as if that wasn't enough, they actually want me to allow access for faculty and students to my administrative database information. This will obviously add to my concerns about security and privacy of information.

I feel lucky that I haven't needed to be concerned with these potential problems and was able to concentrate on the more productive mission of providing maximum and quality information for my administrative users. I believe the complexity of administrative software and continuous revisions to keep current with ever-changing requirements was more than enough to keep our staff busy. Connectivity means that we must now commit some additional attention to protecting data from external users, authorized or unauthorized. This, of course, is in addition to the additional requirements placed on us with learning, developing, implementing, monitoring, and maintaining networks.

Ethics

Ethics is that gray area that deals with things that are done using computers that aren't quite illegal, but aren't quite right, either. I'm not going to attempt to categorize every situation into an ethical or legal issue. I'm neither an attorney nor a fortune-teller. The problem with trying to label different issues is that there are insufficient laws or rules to cover most technical issues and there aren't even adequate definitions to use in identifying the seriousness of each issue. Fed by the complexity of current systems and networks, ethics are usually not in the minds of users as they log in. I believe that there is so much information available to Internet users, that we have totally lost the value of private, secure information. Most hardware and software companies are introducing products faster than the quality control people can verify security weaknesses and the products are installed in our colleges much quicker than we can adequately test for loopholes. As end-users become more independent, they load their own software and wander where ever they want in cyberspace, creating an ever-present awareness by data managers that they are no longer in control of anything.

As management of this technology we are advising, counseling, and providing liaison roles in ethical and legal situations on our campuses. Many times the technical staff make judgements about what is legal and not legal to do on a computer system with little knowledge of what is result of their judgement. This places technical people in a role they were not trained for and usually that they don't want. I know that I find myself, in many instances, defending how we do things to upper-level management as well as the end-user that has become a victim of improper use of resources. The lack of established and clear laws, codes of ethics, policies, and penalties, has made

this aspect of our positions one of the most troublesome.

Some typical questions that complicate the assessment of proper technical usage are:

- Who really owns the data stored on computer files?
- What if the data is about you?
- If an unauthorized person breaks into a system and just looks at your information without altering it, is that illegal? unethical?
- What information can be public? What can't be public? Who should control release of this information?
- When does personal use of technology become excessive or criminal?
- Breaking into a system really breaks nothing, so is this a crime if nothing is altered?
- Who determines when content is offensive to others? What constitutes harassment? How far does freedom of speech go?
- Should it be a crime to share hacked information on public electronic bulletin boards?

This list is far from complete, but it is pretty obvious that everyone has their own opinion about these issues and they usually go so far as to state that there are right and wrong answers to each. This is the precise reason that it is not easy to pin down right from wrong or ethical from illegal. The only thing that is clear to me, is that current technology levels are allowing users to stretch ethical behavior to the limit.

I believe that the information revolution that we have been experiencing has simply provided the opportunity for usually honest people to become criminals. This opportunity has provided a severe temptation to abuse money and power through technology. I feel though that hacking systems is quickly replacing baseball as the number one American pastime and that money and power aren't always the motive. Sometimes the reason for this behavior is simply for entertainment. We have seen all types of media sensationalize the "nerd" stereotype. No wonder some socially inept people might identify with this image and seek to form relationships using the remote and abstract interaction of network computing. Some people just are seeking the intellectual challenge of "beating" a computer or are substituting the undemanding computer relationship for real-life one-on-one relationships with people.

Many times the computer abuse just begins with doing the local mailing list for the local theatre group. Then someone else calls and asks if they can purchase a list of all students and employees on the campus. Before anyone realizes, money is changing hands and the college computer is being utilized for so many off-campus services that our own database information can't be retrieved in a timely manner. When does enough become too much. This is a hard thing to decide and control. When there is financial gain involved, the issue becomes clearer to decide. When issues of this nature occur, it is very difficult to resolve the problem without bad feelings, so usually management turns their heads and ignores the activity. This doesn't help either party, since it sends a message that this "stealing" of resources is acceptable, even though this is not really the management position on the matter.

This personal use leads to other types of resource abuse. The excessive use of resources can involve processing time, computer paper, and access time. Many times game playing on computers

is a huge problem in lab settings. But with the introduction of e-mail and World Wide Web access to the desktop, a new level of abuse corrodes the concept of staff productivity in the workplace. Supervisors now need to struggle with the balance of using WWW as a creative tool to enhance functionality against the wasted time of employees searching endlessly for non-relevant information and trading personal e-mail with friends at other institutions.

The whole area of "freedom of speech" is an ethical nightmare with internet access for everyone. There have been recent laws attempting to control pornographic content on public networks, along with limits on sexual, political, and racial harassment using technology. This is just the beginning. The problem with most of this "small-time" crime, is that most people that are caught, don't even consider their "crime" to be unethical or dishonest.

Earlier I posed the question about whether it was illegal or unethical to simply look at secured data. It is clearly wrong to delete or alter data once a security breach occurs. But what if the person just "looks around" and harms nothing. Like we said, a breakin actually breaks nothing, only security is compromised. If files are copied, the original is left intact. Has any harm occurred other than the hacker did something that they weren't supposed to? The factors at work here are probably the sensitivity and importance of the information, the disposition of the copied software, whether the action was pre-meditated and malicious, and was any damage that occurred intentional or accidental.

Another war that is surfacing as an ethical issue is the battle between social responsibility and intellectual rights. Some users view hacking as intellectual exploration while system administrators see the intruders as criminals. This activity is sometimes ignored, but when networks are disabled or files are altered or deleted this becomes an issue with the same people that viewed it previously as harmless. Some institutions are going to the extent of hiring student hackers to legally attempt to breach their system's security to discover weaknesses and loopholes. Does this make good sense?

Unauthorized access is a game to many hackers and has spread to stealing cable television, free long-distance telephone calls, cellular fraud, video piracy, and reprogramming of computerized devices in the community (traffic lights, elevators, etc.) The realization by technical staff of an institution that they have had a breach of security is the first major step. Acknowledgement of the situation, however, is not that easy. Most institutions are very reluctant to admit vulnerability of their systems. It would be an admission of negligence and reflects negatively on the image and trust of the institution within the community. At these times of extreme competition for recruiting students and being involved in the community, it could be disastrous for an institution to lose public confidence.

Crimes and Technology

Technology has created opportunities for crime that didn't exist even a few years ago. The technology of crime detection grows almost as fast as the computer related crimes, themselves. The scariest factor of all, is that most computer crime is discovered by accident. So how much goes undetected? It is so difficult to monitor how bad this situation is when nobody wants to admit to being a victim.

With some technology-related crimes there is no ethical dilemma. Theft of money, information, or services and the alteration and destruction of information should be considered crimes. What makes this so difficult is that society has a hard time determining these actions as criminal because there usually is no physical evidence of destruction. Without the physical nature of technology crimes the offense doesn't seem quite so bad.

What has happened is that computers have de-personalized crime. Most technology abuses are victim-less or at least the real victim is unclear. Because of this, the person committing the crime, doesn't feel like they have really hurt anyone and most times don't really think about the effect of what they have done. When an individual creates and distributes a virus that destroys the boot portion of a disk, they are harming people that they don't even know. With networking of systems we have created the opportunity for criminal acts with very little, if any, risk. Also, most crimes committed using technology are accomplished by an individual. This further decreases the risk of getting caught, because there are no accomplices. In most cases, the best security is no match for the persistence and patience displayed by most criminals. Constantly the criminal computer user learns how to use technology to combat the technical-based security that has been created to attempt to keep them out.

Security

We work with four categories of security in technology; hardware, software, network, and physical. Depending on your particular setup on your campus you have varying degrees of security at each of these levels. Typical methods are passwording, encryption, virus detection, dial-back modems, authorization lists and firewalls. While this seems like a fair amount of tools to combat the unauthorized hits on our systems and networks, these are a pitiful arsenal of defenses to use against the growing number of hackers in the world of technology. Our biggest problem with security at this point, is that we can allow access for faculty and students to various database information, but we do not have sufficient record-level security to control access to a specific record without allowing access to all records.

Many computer administrators have reputations of being dictators when it comes to controlling access to the information for which they are responsible. A good technology manager must find the best balance between access and security. You can't let security control the accessibility of information to the extent that we stifle constructive creativity. Obviously, everyone is going to have a different interpretation of what is constructive and what is not. The other balance that must be maintained is between the right-to-know and the right-to-privacy. We will talk about privacy later, but the core issue here is the unclear view on ownership of data.

I feel that there are two main areas in colleges and universities where improvement in security can have the most effect. The first of these is to make sure that internal security is equally as impenetrable as external security. Too many times, it has been assumed that the only hits on your system are going to come from the outside. Usually most breaches of security come form current staff or an inside person has aided an outside person in obtaining access.

The second area of security that I think is the most important is physical security. This is unlocked doors to offices and computer printouts sitting on desks. Most people do not even think

about locking up printouts containing confidential information when they are not at their desk. Many administrators would be surprised to find out how many times information is released to people without any technical security breach. For this reason, sensitive information should probably not be printed on hardcopy unless the person utilizing the printout is willing to accept the responsibility to physically protect the information from being seen by unauthorized individuals.

Since we are charged with the responsibility of protecting any information on our systems, we can't simply accept security breaches as a necessary by-product of IT progress. We must continue to strive to keep or staffs one step ahead of our users and allow them the time and resources to capably monitor and protect our access and files.

Privacy

The "information privacy" issue is probably the most visible and the most important aspect of technology use. Keeping information secure is also the hardest part for users to understand. This is primarily due, I feel, because parts of our lives were previously untouched by technology, so there was no need for concern. Now that technology is part of every aspect of our lives, it is most important that we realize our dependence on technology, and adjust our focus to insure that it is utilized safely and securely.

On the college campus, privacy is just as important as in financial institutions. Grades and financial information are obvious targets for intrusion in our local systems. As a result, the most important regulator of this privacy is the Family Educational Rights and Privacy Act (FERPA). More common names are the Buckley Amendment or just the Privacy Act. Basically this law was provided by the federal government to:

- allow students to inspect and review their educational records
- allow them to have the records corrected or amended
- control disclosure of the content of academic records
- establish requirements about what can and can't be made public
- assure that information is being used for the purpose intended
- require the institution to inform students where data is stored, what policies are being followed, who has the right to see their records, and parental access to records
- specify that those responsible for data systems will take reasonable precautions to prevent the misuse of the data and dispose of information properly and appropriately
- determine when written consent will be required to release any sensitive information and to ascertain what data will be considered private

The key factors here are that institutions should create policies to inform students clearly what their rights are under the FERPA law, assure them that these rights will be maintained, and that the institution will strive to comply with all provisions of the Privacy Act. Obviously how well we secure our systems has a direct relationship with how well we comply with this Act.

Policies

Too many times policies about proper use of technology are simply a list of the "Don't Dos".

This is a negative approach and could possibly provide just the incentive needed by a potential hacker to start hitting on your system. I believe the components of a good policy should:

- clearly differentiate between right and wrong
- be consistent across campus and allow for few deviations or exceptions to the stated rules
- allow for distribution of keys to access areas only when absolutely necessary
- establish acceptable use and tie that usage to the overall mission and objectives of the institution
- clearly state institutional position about possession, copying, and accessing of copyrighted, threatening, violent, trade secret, or obscene data, voice, and video
- state the college rules about personal and commercial use of our resources including: political statements, advertising, game playing, unauthorized e-mail use, pornography, inappropriate language and communications, and any activity utilizing our systems that will reflect negatively upon the college
- define penalties and punishments and clearly describe all private and legal actions that will be taken
- clearly differentiate between unauthorized and authorized access of data, accounts, and files
- define misuse but also develop the policy with direction, philosophy, and guidance as the major thrust of the content
- establish specific rules that apply to using the Internet, World Wide Web, and electronic mail.

It is extremely important to involve representatives from all user communities in the development of "proper use" policies. This brings awareness of what problems are being experienced and a clearer understanding by all of how the policies should deal with various infractions. I also think it is very important to create standard forms on security and use that are completed by faculty, staff, and students upon employment or registration with the college that states basic responsibilities and an assurance that they have read and agree to comply with the overall "proper use" policy.

With this onslaught of inappropriate technology use and illegal activity involving computers, there is a major question of general responsibility for morals and values within our technical world. Who should be responsible for these breakdowns in honest behavior? Among the blamed entities are employers, colleges, high schools, and parents. None of these are exactly jumping up and down and accepting responsibility. Obviously our society and culture are major factors in this puzzle, but neither of these are changed that easily. So what can be done?

Recommendations

There are quite a few unanswered questions, and quite possibly you now have more questions than you had before. There are, however, simple and inexpensive things that you can do to try to improve your protection schemes of critical information on your systems. I recommend:

- teaching IT professionals an appreciation for the social and ethical implications of IT and placing value on private, secure information
- developing an ethics component in technology courses
- insisting on passwords for users that are harder to guess and changing them often
- limit access to required files and functions, only allowing users to see what they can use in the more sensitive areas
- managing users and staff more effectively and knowing what the capabilities are of each individual...awareness is the greatest deterrent to problems
- precise policies that stress acceptable use and not just the things users are not supposed to do
- integrate productive uses of the Internet into the normal workflow and establish rules on usage
- keep up-to-date with current security and privacy breaches and investigate affects on your college
- do not allow any access without investigating the security procedures that must be utilized
- make security policies and procedures for recovery after an incident to be made a part of normal disaster recovery planning
- do not create policies without corresponding enforcement penalties and procedures
- demonstrate and be a role model in ethical and professional use of information technology.

It is clear that we will continue to see advances in both technology and abuse of technology. All we can do is commit more resources for security development, view compliance with the Privacy Act as a minimum, encourage ethical behavior with all user communities and keep aware of what is happening in the technology world around you.

References

Guidelines for Postsecondary Institutions for Implementation of the Family Educational Rights and Privacy Act of 1974 as Amended, American Association of Collegiate Registrars and Admissions Officers, Revised Edition 1995

Forester, Tom and Morrison, Perry (1990). Computer Ethics, MIT Press, Cambridge, Massachusetts.

Rezmierski, Virginia (Fall 1992). "Managing Information Technology Issues of Ethics and Values: Awareness, Ownership, and Values Clarification", Cause/Effect, Vol 15 No 3.

Violino, Bob (1996). "Internet Insecurity: Your Worst Nightmare", Information Week, Feb. 19, 1996.

Multimedia in the Classroom: Recollections After Two Years

Stephen T. Anderson Sr.
Associate Professor
University of South Carolina Sumter
stevea@sc.edu

Introduction

I attended a 1994 workshop in Creating Multimedia Presentations Utilizing COMPEL at the ASCUE pre-conference workshop and was instantly enamored with the idea of "spicing up" my computer literacy lectures with hi-tech wizardry ("If you can't wow them with wisdom,.....) After a mere six hours of exposure and limited practice, I felt that I could probably begin to transform what might eventually become the same old lecture notes, however unlikely that may be in this field of study, into a more flexible and exciting set of multimedia presentation materials. I was committed to utilizing multimedia tools to revamp my delivery system and have spent the last two years (as time permitted) doing so.

This paper will demonstrate and discuss the many successes and the frustrating failures of the past two years and offer advice to those who have embarked on their own multimedia adventures or plan to do so in the future.

Software Selection: Authoring Package Power or Presentation Package Convenience?

The first experience I had with electronic presentation materials came through Harvard Graphics, at a time when it allowed for linear slide show creation. At that time, that was all I could handle so it served me well for one year. After attending the pre-conference workshop at the 1994 ASCUE conference, it was obvious to me that what I had done was merely the tip of an iceberg and that a significant investment of time and energy was going to be necessary before I would realize any great gains over mere "slide shows." Early in the workshop, the question of the best software package a beginner should choose was raised. I happened to go to Will's Bookstore at Barefoot Landing the day before the workshop and picked up a copy of a multimedia publication which evaluated 5 - 10 "Presentation Powerhouses" and I made copies to share with the participants. In the comparison, it was pointed out that authoring packages (of that time) often required the user to learn a scripting language and that "slide show" packages of that period were often lacking in their ability to easily implant motion video, sound, and animation without a certain facility in object linking and embedding. Having little experience in either area, I kept reading. The top rated package was produced at a small software house called Gold Disk and their product was called AstoundTM. It rated higher than all other packages (including Powerpoint, Harvard Graphics, Charisma and others) in power and ease of use. After calling them and working out an $89 deal, I made the plunge.

I have not been disappointed. I do realize that in the 2 years since I made the purchase, the other software companies have incorporated many of the features in their packages which Astound originally introduced. The current version, Astound 2.0 and its Astound Studio application package which include Astound Actor, Animator, Draw, Sound, Image and Video still (IMHO) represent the best value at under $100. The only advantage I see in moving to Powerpoint is the number of installed MS Office Professional packages out there now. All competitive packages now include a "play only" executable file which can be legally distributed to anyone free of charge as well as the ability to create self contained executable presentations which can be "run" on any Windows based machine. I also chose Astound since it can save a MAC compatible presentation from within the Windows program (even though our campus is largely a Windows/DOS based environment.)

Hardware Selection: Powerhouse Pentiums or Lowest Common Denominator?

When we obtained grant money to equip our student computer labs and our teaching computer classrooms and our multimedia projection room, we knew we wanted Windows capable machines. Unfortunately, we did not have adequate funding to equip all of our faculty offices with Windows capable machines. As a result, most faculty received 386 systems with 1 MB RAM and 40MB hard disks (1992-93) As money trickled in for updating faculty computers, those who taught Windows software in CSCI courses were given the highest priority to receive 486 machines with 8MB RAM. To accommodate those who wished to have access to multimedia software for development purposes, the Computer Advisory Committee equipped a single "Hi-Tech" multimedia development room in the library with a MAC and a Pentium system, color scanner, color ink jet printer, laser B/W printer, sound capabilities, internet access, and appropriate multimedia development software including Astound. One classroom (the "MM projection room" was equipped with a three gun color projector mounted on the ceiling, a MAC and Pentium system with multimedia capabilities. Another tiered computer classroom had 25 486 systems with a 26th in the front of the class equipped with Tech Commander, a hardware based control system where each student workstation can be "controlled" by the instructor so that the student can see what is on the instructor's screen, or vica-versa, as well as each others' screens. In this way, the instructor can utilize the room to either coordinate "hands-on" lab experiences, or to present multimedia materials to the work stations via the Tech Commander. I will discuss a bit late in the paper some of the problems caused by the different levels of computing power available in the different classrooms as well as the differences between the development room and the class rooms.

Selecting Appropriate Course: Pilot Study or Full Speed Ahead?

As I was the only CSCI full time faculty member (bringing a whole new meaning to the term critical mass) and the only faculty with an interest in multimedia development, there was little competition over the use of the hi-tech room and little question which course would serve as a testing ground for mm application. The large majority of time was spent in the development of materials to be used in our computer literacy course CSCI 101, a decision I am happy with.

In fact, at one point I started to develop materials for other course work until I found I did not have the time to develop high quality materials for many classes simultaneously. The quality level in my presentations started to revert to simple linear slide shows and I did not have the time to gather outside sources of MM materials for inclusion since all of my time was spent "making slides." I

found that my whole first year was best spent concentrating on one class. I was teaching multiple sections of that class which allowed me to try changes "on the fly" often making significant content changes during and between classes. This was preferable to waiting until the end of the day to try to remember what changes to make.

Multimedia Development: Learning Enhancement or Simply "Doc Hollywood" in Academe?

I did fall into some common traps early in my MM development experiences. As many novice MM developers are prone to do, I tended at times to spend too much time on glitzy sound, motion, and animation to the point where it could be distracting to the learner. I did try to implement the suggestions of other MM developers as far as keeping fonts and colors to a minimum to enhance retention rather than distract the learner. Also important was the relative positioning of important material and the positioning of materials such as clip art so that the most important material took visual priority over auxiliary material.

One decision, for example, was to revert to simple slide transitions between slides since some of the more dramatic effects such as "roll down" or "snake in" proved too distracting or just too slow. Another lesson I learned early was to view the color choices on the same equipment and preferrably in the same room under the same conditions as you will display it in final form. At last year's ASCUE conference, I went out of my way to come in to the center room at Water Oaks to view my show the day before I presented it. The projector was somewhat dimmer than the one we use at USC Sumter, so the backgrounds which looked so rich and luxurious on our projection system looked "just plain dark" when viewed on the ASCUE provided equipment. I cleverly went back that evening and switched all the backgrounds to a lighter gradient combination which showed up much better on their screen. When I showed up the next morning to present, I found out that I was NOT in the center room, but I was in the room with the windows and a different projector. We had a good laugh when I started showing my "field-tested" slides only to find them readable but far less than optimal since they were so light. A similar occurrence happened when presenting at a conference at the technical school located approximately 2000 yards from my office. I knew that I needed to assure that the projector would be adequate before the fact since there was no time to "pre"-view it in the room in which it was to be held. I carried our own LCD panel and my personal notebook computer to insure I would be developing and presenting on identical hardware. I asked in advance to see if the lighting could be dimmed to accomodate enough contrast for the projection system to be viewed effectively without turning off all the lights. They assured me they could. When I arrived I found the flourescent lighting had two levels, but both levels were too bright for adequate viewing so we sat in the dark as I struggled to see the keyboard during the presentation. It went better for them since they simply had to view the presentation, but note taking in the dark is not optimal for the typical undergraduate who might take advantage of the dim lighting to catch up on some ZZZ's."

Maintenance: New Hardware and Software Updates Create Opportunities and Headaches

Some unexpected problems occurred when the Pentium systems were made available for MM development in our hi-tech room. We did foresee some of the potential problems regarding the availability of MM resources in ALL the locations they might be utilized: the hi-tech development room, the tiered computer classroom and the MM projection room. For example, it was clear that all the rooms should have a CD-ROM. We did not realize how big a problem would be caused by

having a more powerful system in the hi-tech development room than in the MM projection room. I developed smooth and professional motion video and animated materials in the hi-tech room with its Pentium 90, higher speed PCI 2 MB video card, higher speed SCSI hard disk on a PCI bus, and with a triple speed CD-ROM and 17" high resolution screen. I then would show it on the Pentium 60 with a smaller, slower IDE VESA local bus hard disk, a double speed CD-ROM, a 1MB VESA video card on a high quality three gun projection system. The results were good as far as color, speed of access, and smoothness of transition in animation and special effects... everything except for full motion video where the results were quite disappointing. The CD which came with the CSCI text book contained AVI files which the double speed CD could not transfer quickly enough to avoid choppiness. At many points, the choppiness was so severe that we lost the audio track containing the narration. It became so distracting that we eventually abandoned the initial effort.

In an effort to improve the performance when displaying AVI files, we uploaded them onto a network disk and accessed them from the network drive. When running the AVI file, the choppiness lessened BUT DID NOT disappear as expected. After some troubleshooting trial and error, we determined it was the network card which was now the bottleneck. We then surrendered and downloaded the AVI files to the hard disk as we needed them. This was a time consuming process which could only be done piece meal since the hard disk did not have enough space to save all the AVI files at once. We had to "rotate" the files until a new CD cold be installed by an already overloaded CSD staff. The new CD lasted three weeks before someone loaded two CD's without their caddy, and disabled the CD temporarily. All but the strong hearted would have thrown their hands up in despair long before this. It is important to have a "champion" on campus willing to put up with the early pitfalls and failures so neophytes do not get turned off to the process before they ever experience the benefits.

A second transition problem we experienced occurred when we developed a presentation on a Pentium system and displayed it on a 486-33 system through the Tech Commander in the tiered computer classroom. When many transitions were required simultaneously, such as the simultaneous entry of text from more than one text object, that familiar choppiness would return. This time it simply detracted from the "polish" of the presentation as opposed to the content. One simple transition which was especially slow was the roll down slide transition, especially if the slide contained complex images. Luckily, changing the slide transition to even a large segment of slides is a four or five click operation. When moving from a Pentium to a 486, animation was much slower but we had expected this and made adjustments in the time line to accommodate the difference in CPU speed. The unexpected problem was that sometimes the presentation was to be shown in the tiered computer classroom with a 486-33 and sometimes in the projection room with the Pentium 60. It depends on the day of the week as the class alternates between the two rooms.

Student Reaction: Some for the Very First Time!

The general reaction was very favorable with two notable exceptions. The first, mentioned above, was the disappointing AVI file performance which partially disrupted two class periods by causing delays and distractions. This was temporarily corrected by utilizing the local hard disk to insure adequate throughput to eliminate the choppy motion video playback, with the permanent solution being the replacement of the CD-ROM. The second "circumstance" which proved less than acceptable was the general lighting conditions in the MM projection room. The classroom was not

originally designed to have a projection system in it. The florescent lights were unacceptably bright, yet with the lights off, it was much too easy to "lose" the audience's attention span. We installed recessed lighting with a dimmer which lessened the problem, but the light level still must be quite low to effectively display vivid colors. One interesting lesson we have learned is that the tiered classroom, originally built for hands-on lab experience, is better in may ways for presenting slide material, the only exception being full motion video. They tend to stay more alert and take better notes since they have more light.

On the positive side, the students all liked the fact that notes were easier to take when organized in slide format. They also liked the fact that executable files were made available on the campus network to be viewed after the fact from lab computers. On bad side effect is that some of the less motivated students felt they did not need to attend class as often if the notes were "put on the network" for viewing after the fact. This myth was quickly squashed as they received the results of the first exam. I suggest the same result would likely have occurred to these students had the notes not been made available on the network. The AVI files which showed computer related "movie clips" which came on CD-ROM with the text book were very well received. They were more convenient that renting or buying videos on current events, and could be retrieved relatively instantaneously if one suddenly became appropriate to show due to in class discussions. We had such an occasion when discussing global positioning systems and how they were being utilized by moving companies to keep tabs on the location of their moving vans. During the discussion, we simply said... let's pull up the AVI file and view it now to answer these questions. Without an experiment to test if retention was enhanced, the most I can say is that it seemed that the timeliness of the feedback was appreciated and that the medium used was much more effective than the alternative... "Turn to page ### to see a picture of a GPS and to read about how it is utilized."

I did learn by mistake that implanting a motion video file into an Astound presentation pushed the Pentium 60 just beyond its limits with respect to timely retrieval. I found that running Media Player separately (even in its own window concurrent with Astound) and playing the file directly from it saved time in the long run and let me choose exactly when to show it. It was somewhat slow when run inside an otherwise complicated Astound slide show in Windows 3.11.

Perhaps the most positive aspect of utilizing Astound was the use of scanned images from the text in the shows themselves, with my own annotations transitioning onto the screen at appropriate times. The text we utilize comes with Powerpoint presentations that have all the images of the book included. I found that while I could import the shows and make changes to customize them in Astound, it was far less time consuming to use them as a "guide" to creating my own show in Astound. The initial investment or scanning in the images and the necessary hard disk space were the only extra costs. Since the slide shows that came with the text were "OK" but did not always use the emphasis nor the words I would have chosen, I found these costs reasonable. I would have preferred if the text book publishers had the images stored separately as graphic files, but since the Powerpoint shows arrived as executable files, I have not been able to "clip" the images from the shows themselves. Utilizing a screen capture program would have been at least as time consuming as scanning in the images directly. It also allowed me to freely use (fair use) other sources as well, including advertisements in current magazines, articles and reviews of certain products.

Multimedia Outside the Classroom

I have utilized Astound to produce a multimedia map of our library, various presentations for external visiting dignitaries, a tutorial on "Doing a Research Paper" for use in the library (under construction), and of course for presentations at professional meetings. I have also conducted workshops at professional meetings in Astound. The fact is, I spend between 10-15 hours per week either developing or utilizing multimedia materials I have produced. I would classify an activity that takes up approximately twenty to twenty-five percent of your work week as a significant investment of your time. Granted, there are weeks where I spend as little as one to two hours, but they are balanced by weeks where I spend twenty-five to thirty hours (especially if I am working on a project the scope of the research paper multimedia tutorial.)

Summary

I would characterize my experiences with multimedia in the classroom as successful and rewarding for both my students and myself. The significant time (over the course of year one) spent gearing up to become productive has been paid back in the form of useful and effective teaching materials, tutorials which are being used on campus now, workshops which are helping defrat conference costs at a time where we have no travel budget, thereby keeping me current with respect to what others are doing with multimedia and the internet in their colleges and universities.

Creating a Computer Competency Requirement for Mary Washington College Students

David J. Ayersman
Instructional Technology
Ernest C. Ackermann
Computer Science
and
Paul M. Zisman
Education

Submit correspondence to:

Dr. David J. Ayersman, Director
Instructional Technology
Mary Washington College
Fredericksburg, VA 22401-5358
phone: 540-654-1379
fax: 540-654-1068
e-mail: ayersman@mwc.edu

PREFACE

At the time this proposal was submitted, it was expected that funding would be provided to establish a campus-wide computer competency requirement through Mary Washington College's Funds for Excellence program. Only in the last few weeks did we learn that this funding would not be provided for our project. Based on that news, our original ideas and projected activities have changed rather significantly. Although initially disheartening, the result has been a streamlined and more tightly integrated plan for achieving computer competency on our campus. Our presentation will address the barriers encountered and the challenges posed by establishing a computer competency requirement and will provide a snapshot of our current progress and activities.

ABSTRACT

Mary Washington College is currently completing a $9.6 million technology restructuring initiative that promises to provide a state-of-the-art ATM network and upgraded computer capabilities campus-wide. As the project nears its finish, attention is now turning even more intensively toward how we plan to utilize the network and equipment to achieve our educational goals and objectives. Consequently, we are creating a plan to ensure that our graduating students possess computer skills. Within this paper we address a current review of the literature expressing how other schools approach this issue with a specific emphasis on our MWC efforts.

INTRODUCTION

In the fall of 1995, a few of us at Mary Washington College began investigating the efficacy and practicability of establishing a campus-wide computer competency requirement for all students at the College. An initial step was to investigate the methods and procedures being used at comparable academic institutions for achieving the same goals. A review of literature and a web-based inquiry identified numerous schools that have computer competency requirements. Summarizing this information results in essentially two methods of implementing the competency requirement. One method is to create a discrete and separate requirement that exists outside of the academic program. The second approach involves integrating the use of technology into the courses that students take. While these two approaches seem fundamentally simple and rather different, adopting either approach requires resources of personnel, equipment, expertise, and time that many colleges lack. Selectively adopting aspects of both approaches, borrowing from similar programs that pre-exist on the MWC campus, and developing a high quality computer competency requirement that efficiently utilizes minimal resources is the focus of this paper/presentation and current efforts on our campus.

REVIEW OF LITERATURE

There are simply too many types of computer skills to teach all of them to everyone. As schools began to address the need for fundamental skills with computers many definitions of literacy developed. In the early 1980's, programming skills were often included among the types of experiences that resulted in literacy. More recently, research skills using the Internet and networked resources have begun to replace these early requirements as literacy evolves concomitantly with the newer technologies. Defining computer literacy has been described as hitting a moving target due to the rapid changes that occur in the area of instructional technology. In fact, some argue over semantics as they claim that one problem of relying on the term computer literacy is that it implies the existence of a universal set of skills which every student needs. The argument is that this set of skills doesn't truly exist because of the diversity of computer applications and the rapidity of technological change. In spite of these arguments over semantics, generally speaking, most people tend to use the terms "literacy" and "competency" interchangeably in regard to computer skills. For this paper, we have chosen to use the term competency to refer to the minimal level of skill with computers that we plan to have our students acquire.

The need for technological skills is well recognized and certainly not unique to Mary Washington College. In 1994, the American Association of State Colleges and Universities (AASCU) conducted a survey of its 250 member institutions in regard to several technological issues. One such issue was computer competency requirements. They found that although few colleges have computer experience entrance requirements most have explicit requirements and computer competency goals upon graduation (AASCU, 1995). More than half (58 percent) of the institutions surveyed stated that their students would be computer competent by graduation as a result of completing coursework within specific majors that require the use of computers. At 22 percent of the institutions, a discreet requirement exists for computer competency prior to graduation. Specific computer competency requirements are being considered at more than two-thirds of the 230 responding institutions. Of those already requiring such a competency, it tends to cover computer skills in word-processing, spreadsheets, and database management principles and applications. About one-third of the schools requiring this competency reported that students take a stand-alone course or a series of lessons

integrated within one of their core courses required to fulfill general education requirements. At the other two-thirds, schools reported specific departments holding such computer competency requirements (business, science, teacher education, art, library studies, journalism, nursing and criminal justice). Assessment of computer competency was reported to generally involve course completion, faculty evaluation, self-paced learning modules, completion of exit interviews by computer, and transcript reviews as methods of certifying that students had completed the requirement.

According to a 1996 survey by the American Council on Education (Knopp, 1996), more than half of all college students and faculty members have some sort of recurring instructional experience with information technologies. While some colleges and universities have required that students use and become knowledgeable of instructional technologies since 1982 (see Brown, 1983), many are only now acquiring the necessary resources and expertise for such a requirement. Various approaches have been taken by many schools. By examining these programs, latecomers such as Mary Washington can reap the benefits of these initial efforts.

At Ursuline College, in Cleveland, Ohio, incoming students (freshpersons and transfer students) take an Introductory seminar. Although the seminar combines several subjects, each student undergoes a 90-minute session in the computer lab. This introduction provides the students with fundamental skills using Windows and WordPerfect. Upon completion of this session, students have three choices. One option is to take a computer class where they learn to use various software applications (e.g., Excel, Access, PowerPoint, WordPerfect). A second option is to test-out of the computer class by doing a project and passing a test. If passed, the student gains the same credit as those taking the course. A third option is to attend a 90-minute session in the computer lab with in-depth instruction provided. Computer Services tracks each student to ensure that the computer competency is completed. The faculty at Ursuline College have set the goal of integrating technology into every major by the Fall of 1997. We infer that this indicates a transition from a separate requirement for computer competency to an integrated approach where core courses are identified as using technology.

At Texas Tech University, teacher education students have been required to take a computer competency course as part of their certification requirements since 1985 (Von Holzen, Lee, & Price, 1990). A five-year longitudinal study based on surveys of these students taking the computer competency course revealed increases in positive attitudes toward computers and a corresponding increase in perceptions of their own computer-related skills. We have no evidence indicating a transition at Texas Tech from separate to integrated requirements.

At West Virginia University, students in the Teacher Education program have been required to complete a Computer Awareness Module as a means of establishing their proficiency with computers since 1984. Currently, WVU is revising this requirement so that all core courses in the teacher education program will integrate technology (15 courses). As they implement the new teacher education requirements in the fall of 1997, students will no longer be required to complete a separate Computer Awareness Module.

Hamline University, in St. Paul, Minnesota, is recognized for creating the first undergraduate computer literacy requirement in the United States in 1982 (see URL 1). This requirement was

initially fulfilled through proficiency testing, computer science courses, or self-paced computer-assisted short courses. Since that time, they have revised their computer competency requirement so that it is currently an integrated approach in which traditional courses utilize technology. They no longer require students to complete additional requirements to prove their proficiency with computers.

The American University, in Washington DC, currently integrates computing into all their core courses (Ferren, 1993). These courses were revised to integrate technology as part of general education reform efforts which encompass these computer requirements.

SUMMARY

There are many examples of colleges and universities establishing computer competency requirements. The clear trend seems to be that since 1982 a progression has occurred from separate courses and training to an integrated approach in which technology is incorporated in core courses. While most institutions seem to have initially begun with a separate requirement and then later evolved to an integrated requirement, only partial proof of this has been found.

At Mary Washington, our goal is twofold. We want to ensure that students acquire meaningful skills with technology and we want our faculty to concomitantly increase their technological proficiency. Within these two goals, one objective is to provide a diversity of technology-based experiences so that our liberal arts college doesn't produce students from a cookie-cutter-type mold. Conversely, every student should attain a minimum level of computer competency. Realizing that many other technologies exist in addition to computers, we maintain that a major subset of technological proficiency is a competency with computers. While a definition of computer competency might remain dynamic for quite sometime, we will identify those fundamental skills that we feel are general enough to benefit students of diverse academic backgrounds based on current technologies.

Our project has evolved into a two-phase approach. The two phases are not sequential and are intended to occur simultaneously. In Phase One we plan to develop procedures for providing students basic skills training with technology. The obvious benefits of this are that instructors will not be held solely responsible for providing these fundamental skills and that a minimal level of common computer competency can be assured upon completion of this training. In Phase Two, faculty will integrate technology into the curriculum and a procedure for this process is to be developed. As faculty more extensively integrate technology across a diversity of academic areas, students will graduate with various experiences using technology in addition to the common basic skills. Both approaches offer benefits that we hope to realize.

PHASE ONE SEPARATE COMPUTER TRAINING

Some of the major objectives of Phase One are to:

- Establish specific criteria for evaluating levels of computer competence for students
- Provide a diversity of alternative methods for completing the competency requirement

Specific Criteria for Competency

We have defined the computer competency requirement as targeting five primary aspects of computing. These five components of computing are broad objectives reflecting fundamental skills that we feel all students should possess. They are the ability to:

- create a word-processed document
- create a spreadsheet that involves calculations
- access on-line information from the World-Wide Web
- use the campus computer network to send and receive information
- electronically locate topically relevant information within the campus library

It is expected that additional benefits will occur from acquiring these fundamental skills. Research shows that prior to engaging in successful learning with computers that a reduction in computer anxiety is required and that as students gain computer skills they progress from self-based to other-based attitudinal concerns. These variables will be examined as students engage in the computer competency training. Additionally, many subskills remain to be identified as these five areas of computing are formed into explicit evaluative requirements. For example, students will need to format a disk, upload and download files, login to a computer, and complete other prerequisite skills to successfully complete the five requirements.

Providing Multiple Options for Completion

Establishing an effective computer competency program for the College will require the availability of multiple avenues for fulfilling the requirement. This is primarily because of the diversity of computer experience levels and the various learning style preferences possessed by the students. Some may be ready to test out of the requirement immediately while others may desire (and need) preliminary training before attempting to pass the requirement. Some students may prefer to pick up a printed packet of materials to study before attempting to pass the requirement while still others may benefit more from an on-line collection of tutorial-type materials. All of these options will ultimately be available for MWC students. Initially, students' options will be limited to training, printed training materials, and hands-on proficiency tests for exemption to the requirement. Training sessions will be offered several times each semester and students will need to register to attend. Some instructors may begin to require completion of this training as a prerequisite to enrolling in their courses.

PHASE TWO INTEGRATION

Some of the major objectives of Phase Two are to:

- Establish goals and objectives for Technology Intensive courses
- Define the criteria that will be required for these courses

Our second phase aims to develop an integration of technology and pre-existing course curricula. Initial steps will be to identify the criteria and process by which courses become designated as Technology Intensive. Some important considerations to note are that: (a) this approach broadens computer competency to include other technologies (video cameras, scanners, fax machines), (b) a

cadre of student tutors will provide fundamental skills training to augment in-class uses of technology; and (c) approval of the faculty will be necessary to incorporate yet another intensive requirement.

In the fall of 1982, Mary Washington College implemented a Writing Intensive Requirement for all degree-seeking students. Currently there are 120 course sections offered that fulfill the Writing Intensive requirements. Initially, monetary support was provided for faculty as incentives to adapt their course syllabi to the new WI requirements. In the fall of 1997, MWC plans to implement new general education requirements that will include additional across-the-curriculum requirements of Global Awareness, Speaking, Race/Gender, and Environmental Awareness threads. Once approved, students will be required to complete four WI, two GAI, two SI, one R/GI, and one EI course prior to graduation. Naturally, many courses might carry designations of multiple threads as they fulfill more than a single across-the-curriculum requirement. None of these additional themes is exclusive to using technology.

Goals and Objectives of Technology Intensive Courses

While much remains to be done, we have formulated some preliminary goals and objectives. Some of these ideas are that:

- students should progress from simple to complex uses of technology
- students should progress from being consumers to producers of technology-based information
- a logical and progressive plan should exist that results in graduating students having fundamental technological skills
- all students must have access to technology - access must not be inhibitive to the goals of technological competency
- existing coursework that integrates technology must be recognized
- future coursework (proposed courses) should be targeted as potentially inclusive of technology
- the Restructuring Task Force on Instructional Technology should act as the screening committee to evaluate syllabi of potential Technology Intensive courses
- explicit criteria must be developed that will identify Technology Intensive courses
- extracurricular training must be provided to accommodate students needing additional technology-based skills
- technology-based projects that students develop should be included in their portfolios

Technology Intensive Course Criteria

Similarly, we have only done preliminary work on the criteria for determining Technology Intensive courses. Some of these ideas are that Writing Intensive courses might involve having students:

- create a word-processed document
- create a spreadsheet that involves calculations
- access on-line information from the World-Wide Web
- use the campus computer network to send and receive information
- electronically locate topically relevant information within the Simpson Library
- desktop publishing

- authoring/programming
- databases
- creating web-based resources
- translating file formats
- graphics/drawing
- using/creating digital and analog video
- using/creating digital and analog sound

While many questions remain to be answered, we feel that significant progress has already been achieved. Our hope is that colleagues will share and contribute their experiences and procedures during our session or more extensively by contacting us. As we continue to make progress on this project we offer to revisit this issue with our fellow ASCUE members.

REFERENCES

American Association of State Colleges and Universities, AASCU. (1995, June). On the brink. Report on the use andmanagement of information technology at AASCU institutions.

Brown, P. (Ed.) (1983, May). Computer literacy: Would Plato understand?. Forum for Liberal Education, 5(6), 1-19.

Ferren, A.S. (1993). General education reform and the computer revolution. Journal of General Education, 42(3), 164-177.

Knopp, L. (1996). Information technology usage grows dramatically. Higher Education & National Affairs, ACE. April 8, 1996, 3.

URL, 1. (1996, April) http://www.hamline.edu/orgs/commoffice/factfirs.html

Von Holzen, R.L., & Price, R.V. (1990, December). Five year trends in computer students' attitudes and skill-levels. ERIC document number ED 333 860.

Low Cost, Low Tech, Low Brow Technology: A Plan for Campus Communication

Kurt E. Bernardo
Lake Erie College
391 W. Washington Street
Painesville, OH 44077
(216)639-4700
he274@cleveland.freenet.edu

Lake Erie College is a small independent liberal arts college located in the city of Painesville within the heart of Ohio's Connecticut Western Reserve. Currently Lake Erie College has a resident student population of approximately 125 and a total student enrollment, including full time, part time, undergraduate and graduate students, of less than 700. While the College has a long tradition of liberal arts education the primary areas of concentration deal with equestrian studies, K-8 education, and environmental sciences. Graduate degrees are offered in education and business.

The Lake Erie College was founded in 1856 and at times it seems as though the school's application of academic and administrative computing, as well as technologies of instruction, are still rooted in the mid-19th century. While Lake Erie College does make use of an administrative computing system the connections have been limited to administrators and their staffs in the Business, Admissions, and Registrar Offices. Most newer desktop computers which arrive on campus are placed in our student computer and language labs. These are for the most part 486 and Power Mac machines. On the other hand, all faculty and staff communications, record keeping, and student advising has been done traditionally with pen, paper, student leg work, and filing cabinets. Few of our faculty have desktop computers and the current College budget does not permit us to purchase computers for them. Understanding that we desperately needed to change our present circumstance in an effort to move our institution toward the year 2000 and the fulfillment of our Technology Plan we have had to consider an array of issues. The issues involved addressing needs, acquiring equipment, planning and scheduling training, and utilization. As a result we combined donated equipment and low tech strategies to achieve an inexpensive, yet hopefully temporary, solution.

Addressing Needs

We had some immediate idea about what we wanted to accomplish but a complete assessment of our present computer capabilities was needed before we could accurately establish our needs. What we did know was that as a starting point we had a Hewlett-Packard 9000 Workgroup Server located in College Hall. We also knew that we had scattered among various departments throughout College Hall approximately 25 dumb terminals, and a precious few PCS, which were connected directly to the system. Also connected to the HP server were two modems which allowed dial-up access for anyone who might have the appropriate equipment at their end. These modems were originally installed for Hewlett-Packard diagnostics and software maintenance by our software vendor. At that point the only Lake Erie College users connecting through dial-up were two members of the MIS staff (the entire department!) and one techno-able faculty member. We knew,

too, that the software we were running, the College Administrative and Reporting System (CARS) was capable of far more than what we were using it for. CARS is a college administration package produced by CISC of Cincinnati, Ohio. The package includes modules dedicated to admissions, registration, advising, accounting functions, and other areas of administrative concern. It is the type of package that often makes sense for a college as small as Lake Erie which has a very limited MIS staff.

Our greatest need, then, was to increase the total number of users on the HP LAN, allowing us to use the HP 9000 and CARS package as a much more versatile and useful system. One of the more important options this would allow us to utilize would be a local, campus wide, e-mail system.

We immediately realized that on the down side there were some serious obstacles which would prevent us from simply adding more users. We could not afford, budget wise, to add more ports for direct connections to the HP. Besides, College Hall is an old building, listed on the National Register of Historic Places, and we did not have the staff or resources to begin trying to pull wire through its mazes of walls and structural oddities. Another obstacle which was a real issue concerned our overall budget which did not allow us to buy many computers at all let alone enough for our entire staff of 35 full time faculty members and selected staff personnel. This, in itself, prohibited us from realizing the easiest solution in terms of connectivity, using computers and modems to enable the faculty to dial in to the administrative system.

Acquiring Equipment

The next logical step in computerizing our campus was getting the equipment. What subsequently happened is almost unbelievable. Since Lake Erie College does not have a campus wide Internet connection many of us utilize the Cleveland Freenet, through Case Western Reserve University, as our Internet E-mail connection. Freenets are free, locally accessible, Internet connections offered to any one who cares to sign up for an account. Most, as does the Cleveland Freenet, offer other services such as community announcements, library access, and a variety of information services. On a whim I posted a notice similar to the following item on the Wanted Section of the Freenet Classifieds:

Lake Erie College is in need of any used
computer equipment you might be willing to donate.....

To my surprise the very next day there was a brief response telling me that the person responding indeed had some machines to donate and that I should give them a call. As it turned out Jerry Rakar, owner of Great Lakes Wholesale, is in the business of buying out businesses who, for one reason or another, are liquidating their inventories or office possessions. What Mr. Rakar was offering us was an almost unlimited supply of a variety of old PC's. I mean **old** PC's! AT's and XT's to start with and a promise of more modern machines as we went along. After making a few trips to pick up the equipment we ended up with close to 40 working machines, a number of unopened boxes of software, and a room full of spare parts. Preparing the units for faculty use was an experience in archeology. Most machines had not been touched since the mid 1980's and a few were found to have become great habitats for mice! Other realizations were that most machines were operating on some version of DOS 2.xx, and had 10 megabyte hard drives! Software left on some

units included VisiCalc, and, everybody's favorite, the vi text editor. Along with student help the drives were reformatted, loaded with a newer version of DOS, a shareware communications package, and WordPerfect 5.1. Students had also helped in cleaning and reassembling the computers. All of this was a great learning experience for our student assistants who became better acquainted with the inner workings of PC's and discovered more than they ever hoped to about COM ports and IRQ's. Mr. Rakar's company had also donated enough 2400 bps internal modems so that now each computer was able to be equipped for communicating with our administrative computer.

Training & Utilization

Once the "new" computers were ready to land on desktops it was time to train our new users. This was a pretty straight forward exercise in one-on-one training. After a group faculty meeting, where a demonstration was given and faculty were told what to expect from their new equipment, we began to distribute the computers and offer training on an as needed basis. Much to our surprise very few of the faculty were interested in learning how to use WordPerfect 5.1. Remember, these are educators who, for the most part, do not even have computers at home. We realized quite early on, however, not to force the issue and to let them continue using whatever writing tools they might be familiar with. What all new users did need to be trained for was using our local campus e-mail system. All faculty and staff received user names and accounts on the administrative computer and where trained how to dial-in, login, use e-mail, and exit the system. Each user was also given a handbook which acted as a reference when they found themselves stuck. Since marrying this equipment with our administrative computing system campus use of E-mail has become a popular method of communication among faculty and administrative departments. At this point one of the greatest benefits of using these PC's has been the ability of those faculty members who act as academic advisors to view student records electronically. Now when a student enters their office for preregistration advising the advisor can simply dial up the system, call up that student's records and make timely and documented decisions about what that student should be accomplishing.

Overall Results

The outcome of our experience has been an unqualified success. The fact that all of the equipment we were given is old and out dated means nothing as far as how it benefits Lake Erie College. The total cost for this project was less than ten dollars! This money was spent for cleaning supplies, and a few telephone connectors. Not only did this low cost, low tech, low brow solution work for us, but it had an added consequence as well. Many more of our faculty have been exposed to hands on personal computing for the first time and this exposure has peaked their interest and whetted their appetite for more. Think back 15 years and it's like reliving the first coming of the desktop PC. Many of our new users have now purchased new computers for home use. The downside of this is they now see how really antiquated their office desktop machines are! The positive effect of Lake Erie College's foray into the world of low tech computing is that the college is now actively trying to plan for newer and better equipment for faculty and staff use in not only daily administrative activities, but for on-line research and other academic pursuits as well.

BACK TO THE FUTURE: HELP! IT WAS 20 YEARS AGO, AND WE'VE ONLY JUST ARRIVED!

Kate Coffield
Dept. of English and Comparative Literature
American University in Cairo
P.O. Box 2511
Cairo, EGYPT 11511

Phone: 011-202-357-5104 (Office)
011-202-354-6533 (Home)
Fax: 011-202-355-7565 (Office) [Please include my name and department]
E-mail: kate@auc-acs.eun.eg
kate@auc-sas.eun.eg

ABSTRACT

A Third World Humanities department enters the '70s in the mid-'90s. An English Instructor (concept of network being a Mac and printer) is reborn as "Renaissance Geek", LAN administrator, and alpha-tester of SLIP emulations for UNIX. The Internet arrives, and campus computing (largely ignored for the past two decades) erupts in massive overwork, turf wars, and power plays. The Provost and VP for Computing wonder why they can't dial in. Committees are formed. Restructuring abounds. People want long-range plans, preferably ones that take us into 2001 on a 1984 budget. The Hackers strike back, winning some battles...

THE SPIRIT OF FUTURE PAST...

In 1971, after two years of the post-college disillusionment typical among '60s English grads, I set off for Boston in my '59 VW bug. It was a long drive, but I was sure it would be more like college there than in Akron, Ohio. After about three weeks of job-hunting, I was down to my last $50, and my prospects seemed pretty grim. In that realm of the educated, with PhDs driving cabs and tending bar, nobody wanted to hire a female English B.A., overqualified for secretarial work, underqualified for everything else, and too clumsy and temperamental to wait tables. One day, my employment agent phoned, saying, "Get on over to MIT right away--they *want* a college grad!" I flew across the bridge to Cambridge on my ratty bicycle, looking equally ratty myself (Janis Joplin hair, kangaroo-print hot pants outfit) and reached the upper floors of 545 Technology Square, home of the Artificial Intelligence Laboratory. I still remember details about that day 25 years ago, including everybody's names, but this is a just a summary of events that set the stage for my future with computers.

Following some informal screening, I was introduced to a guy called Marvin Minsky. We chatted a bit, and he asked me how I felt about computers. I told him I didn't feel *anything* about computers, as I'd never seen one. I then spoke to another guy called Seymour Papert, who asked about my fear of elevators and wondered why it didn't carry over to a fear of flying. I hadn't thought

about that, but promised to do so. Back in the main office a few minutes later, somebody came and asked me if I could start the next morning, which of course I could. They'd hired me on the spot, hot pants and all, for no particular reason that I could see--I still didn't get what they were doing or what my job exactly was, although I had a title: "Group Secretary". When I showed up the next day, I was shown into "my office" and introduced to "my computer". I must have asked something like, "What do I do with it?", and was told "Oh, yeah--the instructions are in the top right-hand drawer". (As I recall, the "instructions" consisted of a few printed pages telling me how to log in to the PDP10 and communicate with it in BASIC.) So I did what it said.

I only spent about a year and a half there, but it was more than enough to permanently immunize me against technophobia. I learned that "computer nerds" were interesting people doing interesting things. Most importantly, I was back in academia again! These folks treated me like a college graduate and didn't *care* that I'd majored in English and hadn't had any math since tenth grade. They explained what they were doing (or trying to do), unconcerned that most of it went straight over my head. They took me to lunch with them and invited me to their parties. I was a colleague, not an "office girl". Never mind that much of my time was spent photocopying and "typing"--I would get engrossed in the project (LOGO, ELIZA, VISION, SHRDLU, or whatever) and *forget* I was doing the grunt work I'd gone to college to avoid. When I left, they gave me a farewell party, a sleeping bag, a burgundy leather vest with silver buttons, and a card signed by all the people who were later to be immortalized in Steven Levy's _Hackers_. I "outgrew" the vest but still have the card and the sleeping bag.

BACK TO 1984...

My next decade had nothing to do with computers. But then I found myself here in Cairo trying to come up with a topic for an M.A. thesis in Teaching English as a Foreign Language. Suddenly, remembering the work of Terry Winograd and others, I became curious about the relevance of AI research to language learning, so I wrote my proposal about that. None of the graduate faculty here felt prepared to advise such a project, but they reluctantly agreed to support me if I could do the research. In January 1984, I traveled to the U.S. for that purpose, only to find that the sources I needed were either still "classified" or would cost hundreds of dollars to get copies of. To really do this project, it seemed, I'd have to spend a year or more digging through files at Stanford, Carnegie-Mellon, and MIT. I was told this was post-doctoral research. So I gave up, switched to the "comprehensives" option, and re-worked my thesis proposal into an independent study paper.

By this time, AUC had already begun to computerize. We had a campus computing center and a few workstations around, mostly in the science, math, engineering, and administrative units. There were a few computer scientists among the faculty. We'd even acquired a terminal and printer for the English Language Institute, where I was doing my graduate work, and some of us were enthusiastically teaching ourselves WordStar. The only trouble was, they'd given us an incompatible printer, and so we couldn't print out anything we wrote. Once I needed to do a statistical analysis for one of my course projects. It was supposed to be a simple one, but my design required an "analysis of variance". My professor borrowed a cassette tape with the statistics package and instructions, but the only computer that could run it was in the Math Department. I got permission to use it, but nobody could show me *how*. There was no manual, and I didn't even know what

system it was running--not that it would have helped much. I was entering data for about 150 students, which took time. If I made a command line error, the system would freeze, and I'd have to reboot and start all over again. I lived in the Math Department for about three solid days before finally getting the data entered and the analysis run.

After several such experiences, I abandoned computing for several more years while the PC market and AUC's hardware purchasers got their acts together. It was 1990 before I bought my own PC--a laptop with no hard drive--and was finally able to crank out a few memos, course materials and song lyrics. But I was still pretty frustrated with the DOS user interface and heartily wished myself back in 1971 with the PDP10. In 1993, I sold off the laptop in favor of a used Mac. It went straight from car to closet, as I was heading off for summer leave, but in September I dragged it out, set it up, and finally started getting some real work done. The DOS-to-Mac switch was painless--I missed my "home" and "end" keys, but at least the Mac could make its printer behave. Compared to the PC, it was almost a PDP10!

THE RENAISSANCE...

In Fall 1993, few at AUC had given much thought to the idea of using computers for instruction in the Humanities. Several faculty had PCs or Macs, but that was about it. We'd get the Academic Computing newsletters with all sorts of foreign terms like EARN/BITNET and DOBIS/LIBIS; most of us threw these straight into the circular file. By now, as a result of institutional expansion and restructuring, AUC had a Computer Science major, several public access labs as well as specialized departmental ones, and even a small lab run by the Technical Support Coordinator for the School of Humanities and Social Sciences. But all these were located on other parts of the campus, so we tended to forget about them.

That September, Dr. Thomas Lamont, an Associate Professor of Literature, became our Writing Program Director. He was an avid and experienced Mac user, and through his efforts, our Department obtained a grant for a locally networked Mac lab. To brainstorm ideas for our Writing-Lab-to-be, Tom formed a "computer committee" of faculty who were interested in the idea of teaching with technology or who had already made intrepid forays with their students into AUC's public access labs. Having successfully used my own Mac for a month or so, I volunteered for the committee, hoping to breathe new life into my composition courses, which by the tenth year were becoming rather stale. I'd noticed that my own writing had already become more productive (and in my opinion, better). Also, my writing *strategies* seemed to have changed, and I was curious to see what implications all this would have for our student writers.

Eighteen Macs and four StyleWriter II printers arrived during semester break but just sat around in boxes, because we didn't have any furniture, and the "lab"--a tiny former seminar room--had only a couple of power outlets (although it did have a balcony and a working fireplace). I was dying to open those boxes and get that network set up and get my writing classes into that lab so they could write faster, drag and drop, cut and paste, and use cool fonts like I was doing. Gone would be the days of formal outlining, sloppy handwriting, spelling/grammar mistakes, and mindless revisions. The students would find writing and revision so much easier that they might actually *do* more of it. Most of them were Engineering, Computer Science, and Business hopefuls. Although English was "out", technology was "in", and combining the two might encourage

them to think positively about the Core requirements and Liberal Arts in general. That was my theory, anyhow.

By mid-March, we managed to set up a lab of sorts with some ancient tables and chairs from Stores and a jungle of multiple outlets and extension cords that everyone kept stumbling over. The Apple vendors came in and set up the network, sort of, and installed the software, sort of, and my "electronic classroom" was born. I say "my", because nobody else seemed all that enthusiastic about teaching in it yet. Not only did it look like _2001_ being played out on a stage set from _Oliver!_, but it was truly an ergonomic nightmare: everything the wrong height, glary lighting, direct sunlight, wires all over the place. Things kept coming unplugged, and I'd often get a jolt when trying to reconnect them (220 volts, no grounding, no main switch). It was nearly impossible to figure out what was connected to what--one day a girl set her tote bag down on a cable, knocking out the power to six of her colleagues' stations across the room. The floor was covered with lumpy static-laden carpeting. Cairo dust filtered through the warped old French doors and windows. Stray cats would wander in. More than once, in the morning, I saw a cockroach crawl out of one of the floppy drives. Printing to the StyleWriters took forever, and they kept jamming because everybody would put the paper in wrong. Some of our software included old System 6 programs that crashed with System 7. In the absence of any supervisory staff or security software, much time was spent dragging the System and Application folders out of the Trash and throwing away millions of untitled folders. No two desktops ever looked the same.

In spite of all, our Mac-literate faculty and English majors took to the lab immediately and began to crank out syllabi, papers, and theses. My freshman composition students, too, were generally positive about using the computers and quickly mastered the basics, but there were some unforeseen difficulties. Few of them knew how to type. The grammar checkers couldn't cope with their fractured sentence structures and misplaced punctuation, and they would make *every* change suggested by the spelling checkers, even to their own names. This resulted in some rather odd pieces of writing at first. In the end, though, quite a bit of learning took place in our makeshift lab during that trial semester. The students' progress was encouraging, and my *own* was exponential, I thought. After only five weeks in the world of computer writing (and with no theoretical grounding in the field), I had already arrived at these sweeping conclusions:

> It is relatively easy to introduce students to word processing in a non- threatening way, but only if the instructor himself does not feel threatened by it.
>
> Students in general write *at least* as well on a computer as they do by hand, but they find the process frustrating unless their typing is faster than their handwriting.
>
> Word processing seems to change the way in which we view and manipulate text. Writers adjust to this in various ways depending upon prior experience and individual differences.

We still understand very little about thought processes and writing strategies, and even less about how these relate to word processing. As this knowledge becomes available, we must incorporate it into our teaching in order to prepare our students for the 21st Century.

ENTER INTERNET...

On 5 April 1994, the AUC community received a memo from Dr. Mona Kaddah, Director of our Academic Computing Center. It began: "It is with utmost pleasure that I announce that full Internet connectivity has been achieved at AUC! The connection became operational at precisely 12:30 p.m. today. We have managed to overcome many problems and delays, going to great lengths to introduce the Internet to AUC in as short a time as possible. In doing so, we become the third Internet node in Egypt, and that includes FRCU, the Foreign Relations Coordination Unit, which is the national node in Egypt."

That didn't mean much to me at the time. I was busy preparing a symposium presentation for that weekend, hard at work with my classes in the lab, and making arrangements to leave in mid-May for the Tenth Computers and Writing Conference in Missouri. But sitting there at C&W, blown away by all the post-modern theory, interactive software, hypermedia presentations and glitzy web pages designed by fifth graders, I overheard remarks like, "Hey...remember back in 1984 when we were wondering about using word processing in the composition classes?" I was floored. Our "futuristic" program had *just made it* to everybody else's 1984!!! I decided we'd better downplay word processing, get ahold of some interactive software, and start paying attention to the Internet. Actually, I soon found it written into my job description, as the Writing Lab was to be expanded and renovated over the Summer and, we presumed (wrongly), connected to the campus backbone. Our Assistant Director, Lammert Holdijk, and I were among the first to sign up for Internet training.

In Fall 1994, Computing Services hosted an "Explore the Internet Fair", which introduced us to all the graphical glories of cyberspace. By then many faculty had e-mail accounts and modems, but most of us were (and still are) battling with "dumb" VT terminals, VAX/VMS commands, Lynx, Kermit, and glitchy dial-up connections. The computing staff, ignored for years and unknown to most faculty, were suddenly swamped with requests for training and support, while already working overtime just to keep the system up and handle the traffic. Some of us got to know them pretty fast, and they turned out to be great, helpful folks, but there was a *serious* language barrier that had nothing to do with Arabic or English. What we had were a few highly specialized experts trying to deal with a huge population of newbies. These mainframe specialists, programmer/analysts, network managers, and resource administrators were unprepared for our total cluelessness, and even their basic training sessions were well over many people's heads. We'd phone and say, "I'm having such and such a problem," and they'd say, "That's a datacompressioncommandlineprotocol privilegeviolationfatallynx error--just type <set port telnet profile binary>." They knew what to do, and they wanted to help us, but they didn't yet know how to "dumb down" the *concepts* for people who understood DNS as a type of genetic code and <nobroad> as a sexist slur. We almost drove each other crazy.

"RENAISSANCE GEEKS"...

As demand for Internet support increased, and new labs began to spring up in non-technical departments, a funny thing happened--we faculty actually had to learn some things for ourselves! Gradually, a new interdisciplinary breed of mid-level Hackers emerged. Not only did we get to know the computing staff and start treating them with some respect, but there was a visible shift in the overall dynamics of the AUC community. Most people used to hang out with others in their own

or related fields, but now any given group in the Faculty Lounge might consist of faculty from various disciplines, and maybe even some administrators and interns. More often than not, the topic of conversation would have something to do with computing. Lab managers, whether in English or Engineering, would discuss lab policies and software. Web surfers, whether in Philosophy or Biology, would exchange URLs. And *everybody* would grumble about the VAX/VMS commands and the dial-up lines. But the end result was that we started sharing our bits of knowledge with each other. And because we were out of our element, we knew how to "dumb down".

One of the computing staffers came up with the idea of an "SOS" listserv, where people could post questions, and anyone who knew the answer could answer. It worked something like "playing telephone", in that most people on the list knew *something* and so could pass that on to the other list members. This took some heat off the computing staff (except for the guy who had to manually run the list), and it generally worked well. There were a few problems--sometimes wrong information got out as a result of misunderstandings or typos. Some list members would save information, but others wouldn't. A few experienced users, after giving the same advice to the same people for the hundredth time, signed off the list. For awhile, during the first year, SOS "forgot" its role as a support list and became a forum for gossip and complaints (as one lurking colleague put it, a "Virtual Faculty Lounge"), resulting in even more "unsubscribes".

Embedded in the gossip and complaints were various rumors about turf wars and power plays related to computing. Depending on whom we listened to, everybody wanted control of Internet access, from the Provost to the Management Department, to the Development Office, to the Registrar, to the PR Office. Prior to 1991, Administrative Data Processing had reported to the Chief Financial Officer, while the Academic Computing Center had reported to the Provost. In October of that year, all computing services were reorganized under an Associate Vice-President for Computing who reported directly to the President. At that time, we faculty were too involved in the restructuring of our own *academic* units to pay any mind to computing. But by 1994-95, as we became involved in global connectivity and instructional technology, several events made us aware that under AUC's current structure, Academic Computing had no official accountability to the academic community. This was scary. In Fall 1995, a new restructuring took place that put the Provost back into the picture.

Like most academics, Hackers, whether "real" or "Renaissance", tend to be more interested in getting our work done than in playing power politics. But we all realize that we have a stake in keeping information technology "academic". In two short years, even our non-hacking faculty have become technology-aware, if not technology-dependent. The Internet has become our source for tech support, our link with the rest of the academic world--and sometimes our nemesis. As I write this, I wonder if I'll get off in time to be published. At the end of February, as I was racing to make last minute changes to part of a book chapter, our DNS went down for three days, leaving a co-author with no choice but to send the incomplete draft to the editors.

SO, IS THE FUTURE NOW?

This year, demand for Internet access has escalated in all directions. Here, owing to limited telecomms services, dial-up has been a real problem all along. One weekend, finally connecting after about a hundred redials, I saw that the Provost was online and sent him an e-mail asking, "Are you

having trouble dialing in?" He wrote back, saying something like, "I'm glad you wrote--I thought it was just me!" The Acting VP for Computing has reported the same problems. Having begun with five lines, we now have 19, but they're still inadequate even for faculty and administrators. The VAX system will only support about 65 logins at a time. Access for most students seems a remote dream.

As promised, our Dickensian writing classroom was renovated during the summer of 1994. We now have 30 workstations (in a room that should hold about 15), but with proper wiring, lighting and air-conditioning, as well as static-free flooring and ergonomic chairs. The tables are all the same height (though still the wrong height), and the StyleWriters have been replaced by two laser printers. We've also managed to acquire security, filesharing, and collaborative software, along with a couple of CD-ROM players. But we still have no staff, other than myself (on part release-time/overload) and a few work/study students. I do all the software installations, network configurations, user accounts, and debugging. Our hardware, less than two years old, is already obsolete, and the warranties have run out. The workstations have only four megabytes of RAM, the Quadra 800 we use as a server has only eight, and the LocalTalk network is much too slow for the interactive applications we need to run. Ethernet cabling has finally been installed, but only one of ten promised cards has arrived. We will not have SLIP/IP connections, so I've joined one computer scientist and a few other "Renaissance Geeks" in testing emulation on a UNIX server. But even if that works, how will we run today's Internet software with four megs?

In March, at the invitation of the Provost, I participated in a brainstorming session on "High-tech Classroom Development". In April, at the request of my Dean, I attended yet another brainstorming meeting to help in presenting "department/school views about the role of technology to support education, training, research at AUC for the next 15-20 years". Under discussion at the latter meeting was a six-page plan drafted by the "Educational Technology Subcommittee of the Century Committee", outlining the various goals and objectives we might wish to pursue, along with issues of infrastructure, connectivity, and (last, as always) training and support. We all went around the room expressing our views, visions, and concerns. The last person to comment was our Technical Support Coordinator, who observed, "But all this is what others are already doing! Are we going to spend the next 15-20 years playing 'catch-up', or are we aiming to be a leader in the region?" A heavy question, indeed, for any institution trying to engage in strategic planning involving the future of technology. As yet, nobody has answered it.

Copyright 1996 Kate Coffield. All rights reserved

Starting Computer Science Using C++ with Objects: A Workable Approach

Mary V. Connolly
Mathematics/Computer Science Department
Saint Mary's College
Notre Dame, Indiana
connolly@saintmarys.edu

The curriculum for Computer Science I was well defined in Computing Curricula 1991 [1], but the language (and paradigm) issue continues to be debated extensively. Pascal, a favorite language with many instructors, was designed to help students learn to program in a structured, disciplined way, but has never found wide use outside of academia. Still, during a panel discussion on first languages at the SIGCSE Technical Symposium in 1993, an informal survey showed the vast majority of the approximately 200 people in the room used Pascal. Speakers presented eloquent reasons for change, but instructors continued to use Pascal. In contrast, a post symposium workshop at SIGCSE in 1995 entitled "Learning and Teaching C++ for the Pascal Generation" drew 106 participants[2]. Dick Reid of Michigan State University maintains a list of languages used in the first course taken by the majority of computer science students at participating colleges and universities. In results reported in January, 1996, out of 442 schools reporting, 35.5% use Pascal, 16.5% use Ada, 11.3% use Scheme, 8.8% use C, 7.9% use Modula, 7.7% use C++ and 2.9% use Modula-2. Sixteen other languages were included, each with a percentage less than two. It is important to realize that schools chose to participate in this survey which was done via the Internet.

At Saint Mary's College, any decision on the first language has to take into account the kind of student who enrolls in CS I. Computer Science at Saint Mary's is offered as a minor program; students in the program major in a variety of fields from mathematics and business to history, communications and philosophy. Many of these students ultimately are employed in the computer field, but do not begin their study of computer science with a strong ability to handle symbolic languages and abstraction. Also, since the college offers a minor program, there is not enough time to teach a variety of languages. Students moving to the data structures course, a course which is taught using an object oriented paradigm, have found the paradigm shift difficult even without a change of language. CS I at Saint Mary's is taught with a two hour closed lab, supported by two fifty minute lectures. Students learn by actively writing and testing programs; hence a good supportive text is essential.

At Saint Mary's the decision to change to C++ with an object oriented approach was made when it became clear that good texts were available, texts which were written for beginning students, which followed the Computing Curricula 1991 guidelines, and which used an object oriented approach. Although there are many books available which introduce an experienced programmer to C++, this course demands one in which design principles, programming syntax, program efficiency and the other major ideas of CS I are introduced at a level appropriate for the beginning computer science student.

There is now a real choice of textbooks using C++ which are appropriate for a beginning course. The differences are usually apparent when one considers whether objects are introduced early in the book or later. A good example of the early approach is the book written by Decker and Hirshfield [3]. Classes are emphasized from the beginning. In contrast, the book by Adams, Leestma and Nyhoff introduces objects much later, almost requiring students to make a paradigm shift[4]. Since one of the goals at Saint Mary's was to avoid forcing students to make a paradigm shift in a later course, the text chosen, Computing Fundamentals with C++ by Rick Mercer, was one in which object language is used from the beginning[5]. Students use the correct words from the start, even though it is a few weeks into the course before the design implications are clear. After all the debate on the language itself, it came as a very pleasant surprise that C++ was no more difficult for students than Pascal. Beginning students do not know one language from another; nothing seems "natural" at the beginning. Perhaps all the language anxiety, if it exists, rests with instructors who are comfortable with a particular language. There are now several additional texts available, giving an individual instructor a good deal of choice [6,7,8,9,10,11,12, 13].

Another big decision involved the choice of a compiler. Saint Mary's opted to use Turbo C++ 3.1 for Windows. The campus network was already set up to handle Windows applications at the time, and many students came to the course comfortable with the Windows environment. Also, this choice does introduce students to a fairly realistic real world environment. One unexpected problem was that realistic real world environment. When programs did not run due to the usual variety of student errors, correcting and recompiling the code did not always result in a running program. The Windows environment did not always reset memory to allow the newly corrected program to run. This was frustrating, but it did prepare students for the less than friendly programming environment they might encounter on the job.

The course at Saint Mary's begins using built in classes (much as the old Pascal course used built in types) to develop elementary programs using selection and repetitive statements. Students are introduced to function prototypes by the second week; the old Pascal course had used an early introduction to procedures. One difference is that the object terminology is used from the start, even though students do not understand the concept of a class at this stage. After an introduction to a simple array, students see the need to develop classes and they begin to develop their own classes. For at least the last half of the course class time is spent designing classes and lab time is spent implementing and using them. For example, one lab has students explore the efficiency of the linear search versus the binary search by implementing a class for an array of integers which has both searches and a selection sort as methods. Gradually students begin to understand what a class really is; they realize that the design phase of a programming assignment requires an early identification of the needed classes. By the time two dimensional arrays are introduced, students automatically think about an appropriate class. It should be noted that none of the projects in the course makes use of inheritance; that is left to the data structures course.

One of the more difficult problems in the course involved how to handle character strings. Even in the old Pascal course, this was handled relatively late in the course since the string implementation is non standard in Pascal, usually quite dependent on the editing/compiling software being used. However, it is annoying to assign programs which involve bank records, inventory control or sales processing and never name people or things. Most texts get around the problem by author supplied string classes, again non standard. Although this is fine for simple programs, it is

more problematic when students are developing their own classes. Author supplied files do not always attach to student developed classes correctly. The first time the course was taught at Saint Mary's, the students were well into class development when the problems surfaced; the decision was made to wait until pointers were introduced so that students could handle character strings in their own classes using char * objects and the functions available in string.h. During the second offering of the course, all consideration of character strings was delayed until pointers were introduced. In retrospect this seems better than handing students code which works but is non standard and hides an understanding of how the machine handles character strings.

One unanticipated problem the first time the course was taught was the length of the labs. Although lab exercises were designed to be completed in the two hour period, students frequently needed three or more hours. Part of this was surely due to the instructor's inexperience with student errors in C++, since this was the first use of the language. Another part of the problem was the Windows environment discussed above. Both the instructor and a lab assistant (a student literally getting trained on the job) were present to assist students. As a group the students understood the difficulties involved in such a major change in a course and were quite patient. Although the situation improved during the second offering, labs still tended to be on the long side.

One delightful surprise was how much the students liked what they were doing. Many were positively energized by their work. They appreciated the fact that this was a real world programming environment and were willing to put up with the long labs. At first, it was not clear how the CS I model curriculum would work with the C++ with objects approach, but in fact it is not at all difficult to implement the basic themes using C++. From the student point of view, object oriented programming is just as "natural" as function oriented programming. It is important to observe that no single course will ever introduce a student to all the capabilities of the C++ language. Individual instructors must make decisions about what belongs in a "sane" subset of C++, a subset which gives the students enough of the language so they are able to complete reasonable projects without being overwhelmed by language details.

A shift to C++ with objects in the first course clearly has implications for the rest of the curriculum. Since the object oriented paradigm is not used in all Saint Mary's computer courses, students may have some adjustments to make in later courses. The Assembly Language course at Saint Mary's incorporates C; obviously students entering this course will already know some rudiments of the language whereas before they had to begin with an intense introduction to the language. The data structures course has used an object oriented approach for several years, but it has been implemented in Pascal with units. It will be changed so that the language used is C++, making a much better transition, particularly since a paradigm shift in design will no longer be necessary. In general, the curriculum should be more unified than before.

It clearly was time to change, and the new course is even more exciting than the first Pascal course was years ago. C++ with objects in the first course works, it provides an experience which is needed in the market place and has positive benefits for the rest of the curriculum.

Bibliography:

[1] ACM/IEEE-CS Joint Curriculum Task Force, Tucker, Allen B. (editor). Computing Curricula 1991. Association for Computing Machinery, 1991.

[2] Decker, Rick and Hirshfield, Stuart H. Learning and Teaching C++ for the Pascal Generation. SIGCSE Technical Symposium, March, 1995.

[3] Decker, R. and Hirshfield, S. The Object Concept. PWS Publishing, Boston, Massachusetts, 1995.

[4] Adams, J., Leestma, S. and Nyhoff, L. Turbo C++: An Introduction to Computing. Prentice-Hall, Upper Saddle River, New Jersey, 1996.

[5] Mercer, R. Computing Fundamentals with C++: Using, Modifying and Implementing Object Classes. Franklin, Beedle & Associates, Inc., Wilsonville, Oregon, 1995.

[6] Astrachan, O. L. A Computer Science Tapestry: Exploring Programming and Computer Science with C++. McGraw-Hill, 1996.

[7] Dale, N., Weems, C. and Headington, M. Programming and Problem Solving with C++. D. C. Heath & Company, Lexington, Massachusetts, 1996.

[8] Deitel, H. M. and Deitel, P. J. C++ How to Program. Prentice-Hall, Upper Saddle River, New Jersey, 1994.

[9] Friedman, F. L. and Koffman, E. B. Problem Solving, Abstraction, and Design using C++. Addison-Wesley, 1994.

[10] Lambert, K. A., Nance, D. W. and Naps, T. L. Introduction to Computer Science with C++. West Publishing Company, St. Paul, Minnesota, 1996.

[11] Levin, H. D. and Perry, J. E. An Introduction to Object-Oriented Design in C++. Addison-Wesley, 1996.

[12] Staugaard, A. C. Jr. Structuring Techniques: An Introduction using Turbo C++. Prentice-Hall, Upper Saddle River, New Jersey, 1995.

[13] Tucker, Allen B., et al. Fundamentals of Computing I: C++ Ed. McGraw-Hill, 1995.

WEB DATABASE DEVELOPMENT: IMPLICATIONS FOR ACADEMIC PUBLISHING

Bob Fernekes, Ph.D.
Gregg-Graniteville Library
University of South Carolina - Aiken
bobf@aiken.sc.edu

ABSTRACT

This paper is a condensed version of the conference paper which will discuss in detail the development of an Internet accessible database and search tool for locating and distributing company data and scholarly work. Based on a pilot project completion date of May 31st, the conference paper will expand this paper's sections, as well as cover issues addressed, technology enablers, maintenance, and future direction. The online portion of the presentation will demonstrate Web enabled database features for supporting new modes of organizing and presenting information on the Net through joint ventures. As a cooperative venture between Georgia Business Net, an Internet service provider, and the presenter, the Web smart database is designed to fulfill the four objectives described below.

INTRODUCTION

As a team project, this initiative draws its strength from the following mutual objectives agreed to by team members: (1) to develop a Web accessible database and decision tool that creates Web pages on the fly; (2) to design an easy to use end user forms-based input system for creating and updating entries; (3) to develop a tool for organizing and distributing information on startup growth companies and market leaders covering primarily computer software firms that have Internet products and services; and (4) to provide a forum for entrepreneurs, business students, faculty, analysts, and venture capitalists to share their views, papers, case studies, and company reports. Prospective
end users are the above participants, as well as others seeking information on specific companies, their products and what makes them a growth company. A review of the literature and related Web sites confirmed that our objectives were on target, and that we had the necessary expertise, software, hardware and Net connections to accomplish the team's objectives.[1]

PLANNING, DESIGN AND DEVELOPMENT

Early on, we realized that the manner of presentation and usefulness of content were key to

[1] Team members: George Carden, Vice President, Georgia Business Net; John Rigdon, Marketing Manager, Georgia Business Net; Heston Newland, Data Coordinator for Pilot Database; Sean Kenworthy, Systems Analyst; and Bob Fernekes, Project Coordinator.

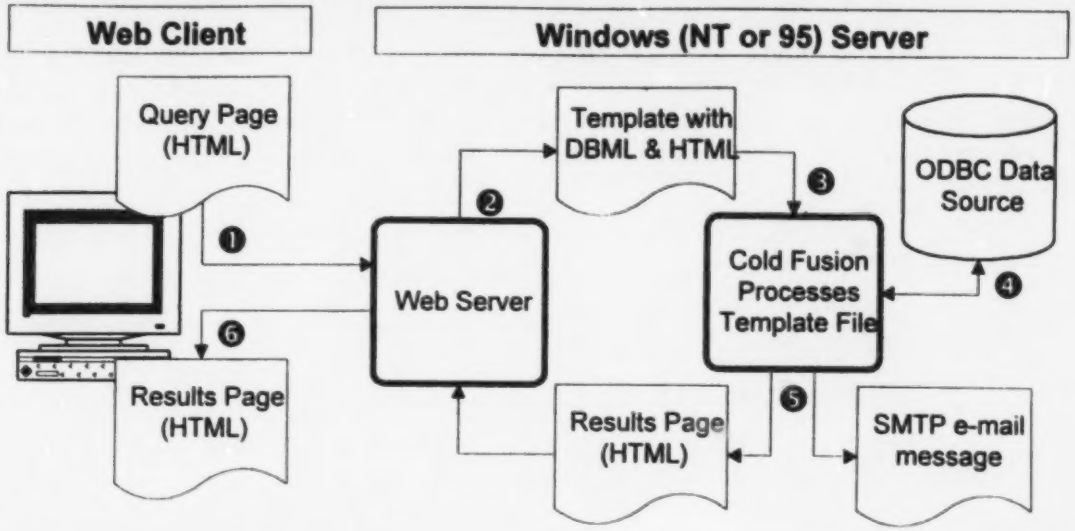
distinguishing this site from similar offerings. Accordingly, our Web page titled " The Net Effect" was designed to provide easy navigation to all site features. Foremost, the scope of the supporting databases encompass the theme of wealth creation in the 21st century and focus on growth companies as the wealth creators. Thus, the site with its focused content and analytical capabilities is viewed as a "thesis driver". Leveraging the latest Internet developments, this site will serve to integrate thesis information on the theme of wealth creation, and to provide a unique analysis function lacking at other sites.

Todate, Information Technology has been largely devoted to harnessing computers and network technology and to getting things to work. In constrast, today's challenge is to design information systems that respond quickly and intelligently to the needs of a growing number of individual and workgroup users. Accordingly, the commercialization of the Internet during the past two years has produced a wellspring of new companies with more adaptive, responsive solutions for integrating legacy databases and the power of the Web. One such company is Allaire, LLC, which has developed a product called Cold Fusion.

Selection of Cold Fusion v1.5 from among the growing list of products is a tribute to all startup companies racing to the Internet with their tools for developing corporate applications. Building on the page metaphor, Cold Fusion is a development tool for delivering Web-based database applications on a Windows (NT or 95) server. To provide this functionality, Cold Fusion uses the following four technologies as building blocks: Hyper-Text Markup Language (HTML), Common Gateway Interface (CGI), Structured Query Language (SQL), and Open Database Connectivity (ODBC). What is exceptional about Cold Fusion is its ease of use as a development tool and its performance in rapidly delivering requested information. Cold Fusion's simplicity comes from using HTML to specify all data formatting and presentation, and using Database Markup Language (DBML) tags rather than programming in Visual Basic, C++ or Perl. The primary DBML tags providing most of the core functionality are DBQUERY, DBINSERT, DBUPDATE, and DBOUTPUT.

Assembling the resources for the pilot project also entailed selection of the server platform and software, as well as database software. Key considerations guiding our respective decisions were providing efficient service and compatibility with Cold Fusion. The dedicated server is a 586 computer (64 RAM, 4 GB) running Windows NT, Netscape Communications/Commerce Server software, Cold Fusion v1.5, and FoxPro v2.6. At its present location, the server has a T-1 Internet connection provided by Georgia Business Net.

The basic idea of how Cold Fusion uses templates is illustrated in this diagram.



Note: Diagram reprinted with permission.[2]

1. The user completes the form and submits it to the Web server which opens a Cold Fusion process in step 2.

2. Next, the Web server passes the client submitted data to the Cold Fusion process and points it to the specified template file.

3. Cold Fusion reads the client data and processes the DBML commands -- the type of request to the database and the results page format for presenting data.

4. Using ODBC, Cold Fusion interacts with the database.

5. Cold Fusion creates a Web page on the fly containing the requested information, and sends it to the Web server. The results of the query can also be sent as an email message.

6. Lastly, the Web server sends the generated Web page to the user's browser.

DISCUSSION AND ASSESSMENT

This section will be completed for the conference paper upon conclusion of the pilot project.

[2] Cold Fusion V1.5 User Guide (Minneapolis: Allaire Corp., 1996) 16.

CONCLUSION

This paper provides only a preliminary picture as the team works through the pilot project. The author believes that this project will demonstrate that Web enabled database applications, such as Cold Fusion, introduce a new level of collaborative interactive analysis for users, particularly scholars and researchers within specific fields.

REFERENCES

Cold Fusion V1.5 User Guide. Minneapolis: Allaire Corp, 1996. (http://www.allaire.com)

DBMS: Tools & Strategies for IS Professionals, ODBC Supplement April 1996.

Internet Systems: A DBMS Supplement May 1996.

Using a Computer Program to Enhance an English Course in the Novel

David Field
Associate Professor of English
DePauw University
Greencastle, IN 46135
Phone: 317-658-4686
Home: 317-653-3312
email address: dfield@depauw.edu

I regularly teach a course in the history of the novel; in it, I have passed around art books, shown slides, played music from a CD player, and drawn inept illustrations on the blackboard. When I pass the art books around, the students who hold them look at them with some discomfort, well aware of the other students straining to get a glimpse of the images on the page. Those other students pay no attention to what I'm saying. By the time the book has made it all the way around and we start discussing an idea connected with the particular painting I want to discuss, those students who saw it first want to look again - they've already forgotten the details of the painting. When I show slides for the class, the class comes to a standstill while I darken the room and fumble with the projector, which frequently malfunctions. Even if it works, I can't adequately display two slides at once or move freely from slide to slide. Videos and CDs prove equally frustrating for me and disrupting for the class: with CDs, I struggle to find the exact passage that I want to play; with videos, I drag in the television and VCR, fumble around with the cords, and try to get the class' attention.

For a long time I have dreamed of teaching in a perfect classroom, one that would allow me to project images, play music, show movies, run animations, and seamlessly integrate all these elements into the class without interrupting the flow of the discussion.

Two years ago, a computer-science major who had taken my novel class heard me describe my dream of a perfect classroom. He told me that I needed a computer with a projector more than I needed a fancy classroom, and he said that Carl Singer, the Director of Academic Computing at DePauw, was looking for a project that could use technology to enhance teaching. Tim said that my course would fit into Carl's goals and that the technology would, in fact, eliminate the logistical difficulties I faced.

So, when Carl solicited applications, I told him about the course and my goals. After a good bit of discussion, he chose my project as the one he would develop over his sabbatical. The more I talked about the project, the more excited I became and the more multimedia projects I entertained. Looking at the commercial CD-ROM's I owned, I became convinced that I wanted a timeline like Encarta's, interactive music like the Multimedia Mozart and Beethoven, and a multitude of paintings like Art Gallery. Once Carl's sabbatical began, we began to analyze the course, looking for ways to implement my ideas. At this point, Carl made it clear that he wanted to rein in my desires for a multimedia fair. From the computer expert, I was hearing that I had planned too much, that I was letting the technology overrun my course, that the students would get lost in a thicket of electronic

marvels. Carl spent hours grilling me about the goals for the course and its overall structure. While I denied that the course had a particular underlying theme (I try to "teach the conflicts," letting students debate issues that really will never be resolved), Carl kept asking me about why I did certain things and not others, why I focused on particular issues and not others, why I read certain passages and not others. Eventually both he and I saw that there was an underlying theme to the course: I looked at the novels as portraits of a very flexible human nature (but a human nature in which the desire for higher truths and the failure to find them remained fairly constant through 350 years) in the context of a culture that was steadily changing, moving from a feudal system of static social structure, an economy based on barter, fixed and definite gender roles, and deep religious beliefs toward a much more secular world of capitalism, trade, technological advance, and democratic ideals.

From that point, I scaled back my desires to include an extravaganza of multimedia events in my class: I looked for the images, texts, and music that fit into that overall framework. Carl used Toolbook as the engine to run a program for my course. Since we had spent dozens - if not hundreds - of hours working on the structure, I found that, as I scanned in images and recorded music, each piece of content fit into the overall framework. As I brought in more and more content, Carl adjusted the structure - but, at all times, we worked together to make sure that the technology served the course, and we asked questions about how best to convey information and strategies of analysis to the students.

Before working with Carl, I opened the course with a discussion about heroism: I got the students talking about cartoon characters like Superman and Superwoman, Batman and Catwoman, as a way of helping them enter Don Quixote's world where a normal, non-heroic and very human being thinks of himself as a romantic hero. This had served an important purpose in my class because, in addition to introducing the students to Don Quixote and the nature of comic deflation, I also got them talking from the first day, an important goal since my class always involves a lot of discussion. After working with Carl and discovering the theme of my class, I rethought the opening class; now I get them to talk about Barbie - their experiences with Barbie and what they think Barbie stands for in American culture. Since I can now use images with the computer program, I next have them look at Fra Fillipo Lippi's Madonna and child, asking them to compare and contrast Lippi's Madonna with Barbie (this leads to a spirited discussion). Next, I show them Botticelli's Birth of Venus and ask them to compare and contrast Venus with Barbie - and another spirited discussion follows. Finally, I show them Botticelli's Birth of Venus morphing into The Birth of Barbie.

My ability to project these images transforms the class: instead of passing a book around, distracting all the students, now I get their attention focused on the image at the front of the class. Instead of trying to pick my brain and figure out "what you're getting at" (as they put it), they get so involved in the curious issue of how Barbie might in fact resemble Lippi's Madonna and Botticelli's Venus, that they almost forget they're in a class and get excited when they make connections.

Instead of fidgeting as I fumble with a CD player, they now listen carefully as a class to the music I play, and I have been amazed at their sophistication at discussing music with which they're not familiar. Instead of my awkward drawings on the board, I can show them the Ptolemaic system directly compared to the Copernican system - and a portrait of Galileo looking through a telescope (at almost exactly the same time as the publication of Don Quixote), as he determined through his

careful observations that Copernicus was right and Ptolemy wrong, earning the wrath of the Inquisition (parodied in Don Quixote when the housekeeper, niece, curate and barber burn Don Quixote's books). I can now show El Greco's paintings of St. Martin and the Beggar and The Burial of Count Orgaz to illustrate how Don Quixote wanted to see himself; I can show photographs of the windmills in La Mancha to show how the world of incipient technology and industrialism knocked him over the head for his beliefs.

I can now tie my course together by returning to Velazquez's Las Meninas when we read To the Lighthouse, by Virginia Woolf, and encounter a character named Lily Briscoe who upsets other characters by painting abstract images to represent the scenes around her. By projecting Las Meninas together with one of Picasso's abstract images based on the earlier masterpiece, I can demonstrate ways that visual art went through something closely resembling the transformation through which narrative went at the same period. I can compare the ethereal music of Tomas Luis Victoria, a contemporary of Cervantes, with Schoenberg's atonal musicùand illustrate the ways that music also became more abstract and less harmonic as the instruments grew free of a hierarchical structure.

At the end of the course, I teach Lolita, in which Vladimir Nabokov's character Humbert Humbert compares Lolita directly to Botticelli's Venus. The ability to project Venus and Edvard Munch's Madonna brings me full circle: technology allows me to show images from the very first class to the very last class, to contrast music from the period of the first work to music from the 1950Æs.

Although we intended for my course to drive the use of technology, still technology has changed my course: the freedom to integrate images, music, and text has improved my course immeasurably. Furthermore, the long planning stages that we went through provided an example (too rare in academia, so far as I can see) of genuine faculty development - instead of facing judgment, I faced intense questioning that had no penalty as an outcome - no denial of tenure or promotion - but instead an outcome that both Carl Singer and I desired: a better course for the students.

We already have evidence that the program provides a better course. We gave the students a test before the course began, asking them to name the century in which the books were written as well as artists, composers, and scientists from the period of the books. Some striking examples illustrate the students' ignorance of history going into the class. One student, who had read Don Quixote (1605/1615) in high school, said that it was written in the 18th Century, and that Picasso was painting and the camera was invented during that period. Another student put Don Quixote together with Einstein in the 19th Century. Yet another, who had read Robinson Crusoe (1719) in high school, said that it was published in the 19th Century when the telephone was invented; a more adventuresome student put The Grateful Dead as contemporary music with Robinson Crusoe.

Such lack of historical perspective makes critical thinking impossible. When asked to analyze how a literary work might reflect a scientific idea from the period in which it was written, students remained completely abstract, saying, for example, "Science and technology have powerful effects on literature because they bring about change. Authors often write about subjects affecting their lives." After the course, that same student (who had read Don Quixote in high school) wrote, "The scientific ideas of a time period often influence writers to question their current beliefs. In Don

Quixote, Sancho Panza says he opens his eyes when he is on the wooden horse and sees people walking around on a world the size of a hazelnut. Galileo was, at the same time, introducing his research that showed that the Earth wasn't the center of the universe."

In short, the program enhances the course by allowing me to present information in a form the students can easily comprehend. It helps the students see relationships they would otherwise ignore, and it dramatically increases their ability to analyze difficult issues.

A Team Approach to Managing Technology: Despite Our Differences - We Had To Make IT Work!

Peter R. Giuliani
Assistant Dean, Technology and Science
Franklin University
201 S. Grant Ave.
Columbus, OH 43215
(w) 614-341-6266
(f) 614-224-4025
e-mail: giuliani@franklin.edu

ABSTRACT:

Franklin University, a private urban university with approximately 4500 students located in Columbus, Ohio, recently completed the initial phase of a long-range, campus-wide technology plan. The plan is to create a well supported and managed computing and communications infrastructure focusing on five elements: 1) User Support Systems; 2) Classrooms and Laboratories; 3) Offices; 4) Outside Access; and 5) Network Infrastructure.

This plan is guided by a five member self-directed team representing administrators, faculty, and staff. Contrary to traditional IT administrative structures utilizing a Chief Technical Officer, a team approach to making all strategic and tactical decisions has many advantages and disadvantages. This paper will identify the major events, problems, and triumphs encountered by the team within these processes:

- Defining who we are as a team
- Assuming additional roles and responsibilities
- Planning and managing capital and operating budgets
- Communicating to stakeholders
- Managing multiple projects
- Negotiating with vendors
- Hiring and managing a technical support staff
- Resolving team conflicts

IN THE BEGINNING

Fall of 1993 was a low point for technology on the campus of Franklin University. Despite allocating 10% of the annual budget for technology over the past five years, students and staff frequently complained of out-of-date workstations and software, inability to share data, no means of communications beyond the telephone, and no support for improving the situation. While planning for the 1994-1995 budget, the Academic Vice President established a cross-functional team of faculty and staff to advise him on technology matters. The committee known as Ad-Hoc Instructional Technology Committee (ITC), was charged to research and develop a 3-year technology plan and establish a scheme for priority of purchases.

Before any work could be done on the Plan, the ITC established a vision for technology which reads:

> "Technology will facilitate the formation of a partnership for learning with and among Franklin University students, faculty, administrators, and staff. This partnership will produce and deliver the highest quality educational programs and services. To meet this goal, technology must be used in five ways: 1) serve the students, faculty, administrators, and staff to promote the highest level of learning and productivity; 2) increase the effectiveness of the learning process; 3) increase the efficiency in performing work; 4) increase collaboration and relationships through improved channels of communications; and 5) increase technological awareness and skills of the Franklin community resulting in graduates who are technically literate appropriate to their disciplines."

These statements were to form a bond with the mission of the University and an agreed upon direction to follow.

The ITC produced a general plan for technology over the next three years. Beyond three years, opportunities for new technologies would need to be re-evaluated. The ITC analyzed these segments of the University environment: User Support Systems; Classrooms and Laboratories; Offices; Outside Access; and Network Infrastructure. Within the Plan, the ITC devised a system for yearly spending. The priorities are: 1) The University should ensure that instructional technology equipment is appropriately maintained or replaced to provide reliable service to students and faculty; 2) Each faculty member should be empowered to determine which computer system is best for their own use, in the context of their program; 3) The University should provide equipment and staff responsible for developing and maintaining technological solutions for instructional problems; 4) The University should provide sufficient funds for the routine upgrading of instructional technology resources; 5) Resources should be expanded to meet the increased demands of students and faculty; and 6) The University should provide a contingency budget for instructional technology equipment which may be purchased during the budget period.

THE DECISION TO MANAGE TECHNOLOGY BY A TEAM

For Franklin University, the problems with a hierarchical model for managing technology resulted in a management system which lacked broad-based input to the technology issues, effective academic support services, ability to integrate administrative and academic technology needs, and the ability to move quickly as new technological opportunities arose. The President of the university, influenced by the movement to flatten the organization and create self-directed teams, assigned five persons, three from administrative operations and two from academics, with the task of deploying and managing campus-wide technology. The Team is composed of: Assistant Dean of Technology, Instructional Designer, Director of Institutional Research, Director of Administrative Computing, and Director of Facilities.

The charge from the President was:

> "The Technology Deployment Team will operate as a self-directed work team, working for the University, responsible to the University and each other, and

> operating as a quality-centered process. The Team will manage all technology on campus; set policies, standards, and priorities; manage the total technology budget; hire technical personnel; identify and remedy any problems before they become crippling; set time-frames; and identify and recommend vendors. The President of the University will represent the University community. The three Vice Presidents (Academic, Student Services, and Finance) will serve as a Steering Committee."

There was apprehension expressed by some team members such as: "why me?" and "how am I going to get my other work done?" However, there was unanimous agreement to make it work. Without a structure or general set of expectations, and given an approved budget and a general plan, the team was sent on its way.

DESPITE OUR DIFFERENCES - WE HAD TO MAKE IT WORK!

Having never worked on a common project, the Team's first decision was to have a retreat away from campus to discuss the role of each individual and to get to know each other. Because of three factors, the Team decided to be sensitive to issues and models relating to team formation and dynamics, but to focus primarily on operating within the unique culture of Franklin University: 1) decision to move quickly on technology deployment; 2) no budget was allocated for team development; and 3) none of the team members had time to attend team-building seminars.

IDENTIFYING WHO WE ARE

The TDT decided not to engage in personality profile assessments, such as Myers-Briggs, but to focus on a more humanistic approach of sharing, valuing and respecting what is important in our lives and which personal agenda we need to spend time with and hold higher than participating on the team. The team used two questioning processes to find and structure our operations in our own manner. The first process was to identify who we are and the second was to fit these assets and liabilities into team responsibility.

The first questioning process answered the following questions: Who are you? - Personally and professionally; Why are you on the team? - Administration's perception of you; What can you do for the team? - Realistically, all things considered; Can you handle the extra work load? - Impact on your "normal" work or your private life; What do you need from the team to be your best? - Within reason; and What should be the team's rules and procedures? - We must agree on how we are to operate.

The second questioning process identified the knowledge and experience we have as individuals which would classify us to be leaders, or supporters, or non-participants in executing team responsibilities. Our backgrounds and current responsibilities established the following roles: Assistant Dean of Technology - facilitator, coordinator and project management; Instructional Designer - training, information and PR; Director of Facilities - budgets, contracts, and vendor relations; Director of Institutional Research - office requirements and training; and Director of Administrative Computing - administrative re-engineering and data conversion.

TEAM OPERATING PROCESSES

The operating process adopted by the TDT was to create a vision of the ITC Plan, break the vision into realistic phases, establish priorities, seek funding, and constantly communicate with ourselves and others. The team believed that they could not function or achieve goals without a mission, values, trust and empowerment.

The TDT mission:

> "The Technology Deployment Team will: establish short and long-term objectives, plans, and priorities of strategic technology-based applications which meet or strengthen the University's mission; promote effective technology use by faculty, staff, and students; establish policies and standards related to the acquisition and maintenance of computer hardware, software, and data; formulate policies, rules, and procedures in conjunction with faculty and staff special interest groups for the purpose of securing the most cost effective use of technology resources on campus; communicate with faculty and staff regarding anticipated hardware, software, network, and service needs; prepare and administer the annual budget for technology related to administrative and academic needs; recruit and select technical and user support positions; provide appropriate reports and summaries to the Technology Steering Committee (three Vice Presidents)."

To be efficient and achieve maximum productivity, the following Code of Conduct was agreed upon: 1) No discussion of team issues prior to complete resolution; 2) Trust each member of the team; 3) Provide information equally to all members at the same time; 4) Keep everyone abreast of each others work; 5) Respect for disagreement; 6) Keep an open mind on all issues; 7) Each has a right to respectfully decline "opportunities" for additional responsibilities; 8) Avoid interrupting others while they are talking; 9) Meetings will be held weekly and the agenda will be set prior to the meeting. The Technology Support Team secretary will take notes, prepare and distribute minutes; 10) Suspend Robert's Rules, however, majority rules; 11) Voting on issues will occur only if it is evident that there is disagreement; 12) Issues must have two-thirds of members voting; m) Commitment to making the TDT work; and 13) Do "whatever it takes" to complete our mission.

The TDT assessed the current climate for technology and recognized barriers to the efficient deployment of technology. These barriers are: conservative institutional structures; faculty, administration and staff committed to traditional unproductive work methods; lack of recognition for technology's ability to improve the teaching, learning, and administrative processes; insufficient financial resources to adequately fund the technology; the rapid pace of technological change; the complexity of electronic networked systems; disproportionate access to technology from one academic or administrative unit to another; and lack of a formal training system.

COMMUNICATIONS TO THE UNIVERSITY COMMUNITY

The expected impact of the ITC Plan to the culture of the institution was to raise a awareness and apprehension of all segments of the University community. Therefore, the TDT saw the need to establish effective communication channels to assist in the dissemination of information. The

administration was well aware of the many horror stories of schools purchasing obsolete equipment, buying technology just before prices dropped, technology not designed for the user being unused, and the need to provide expensive and expanding technical support staff. The goal was to reduce anxiety and increase positive expectations. Frequent updates appeared in the staff newsletter and student newspaper and status reports were prepared for the President, Vice Presidents and the Board of Trustees.

ESTABLISHING A PROJECT NAME

The TDT's mission and vision had to have a project name that could be used by all constituents to formalize an entity about to be developed and implemented, and which would be the target of everyone's efforts. The name "FrankliNet" was adopted for the complete campus networked environment. Following the lead of other institutions, the name was valuable for establishing the vision. In fact, a logo also was developed. The name and logo appeared on team communication documents.

SYSTEM DEVELOPMENT METHODOLOGY

The TDT followed a structured system development methodology to guide the Team's work and actions through to the implementation of FrankliNet. The life cycle of the project involved 12 phases: 1) Understand the business and academic environment through a process of questionnaires and interviews; 2) Create a complete and thorough list of functional requirements; 3) Prioritize the requirements based on University-wide demand and maximum utilization of resources; 4) Publish and share the prioritized list with the University community and hold open forums for discussion and fine-tuning; 5) Prepare a capital and operating budget plan; 6) Hire the necessary technical personnel; 7) Prepare a project implementation schedule; 8) Acquire equipment and services; 9) Conduct training; 10) Test the complete system; 11) Publicize the "roll-out" of the system; and 12) Implement the Help Desk and other support services.

A SIX PHASE PLAN

A process of converting the ITC Plan into a plan for implementation resulted in an identified set of functional requirements to be achieved by the year 2002 to coincide with the 100th anniversary of the University. Franklin is to put into action a significant portion of the technology plan in six phases: 1) Build the data communications infrastructure for FrankliNet; 2) Reach the university community at distant locations; 3) Develop and use interactive multimedia methods in the teaching and learning process; 4) Reassess the original Plan and expand the functionality of the network; 5) Integrate academic and administrative programs and services into the network; and 6) Connect to corporate networks. The term "years" was deleted because the success of completing the phase is related to tuition-based revenues and should not be linked to a specific point in time. These phases would overlap, however, the phase designation would allow the Team to identify specific units where much of the research, experimentation, and funding would be concentrated.

The vision for FrankliNet could be exhibited in a description and a set of goals. Creating a verbal image of the network was an effective tool for focusing activities toward the same objective and providing terminology that everyone in the organization could use and understand.

FrankliNet as described by the TDT:

> "FrankliNet is a complex data communication facility composed of wiring, communication links, servers, and software that actually interconnect all end-user computers designated to be on the network. The goal of the campus network is to provide a fast and reliable data infrastructure to allow computer users to address common needs and foster collaborative work and decision-making. The entire network will be managed by a team of technical professionals. Initially, software for the network will be Windows-based and include electronic mail, word processing, spreadsheet, database management, electronic calendar, and various utilities to improve work productivity. Users will also have access to Internet's world-wide communications and information resources."

SUPPORT ORGANIZATION

The TDT recognized that a wide range of talents would be needed to provide the design, development, and maintenance needed to support FrankliNet. The Technical Support Team was created to provide faculty, staff, and students with an integrated, broadly accessible information, voice, and video communications technology infrastructure. The following new positions were created as a customer centered, quality conscious Technical Support Team: Instructional Technologist, Video Technologist, Trainer, Help Desk Coordinator, Unix Administrator/Internet Consultant, Clerical support, System Programmer/Analyst, Application Programmer/Analyst, Telecommunications Specialist, Network Technician, Network Operator, and Computer Technician. Even though each member of the Technical Support Team is mentored by at least one member of the TDT, the entire Technical Support Team is responsible to and evaluated by the TDT.

BUILDING FRANKLINET

To assist in the conversion of the functional requirements into a technical design for the network, a consortium of three companies was formed to provide expertise in three areas: Infrastructure, Installation and Configuration, and Access. The three companies agreed to have their engineers work together to provide the best possible design. Upon completion and approval of the design, a cost estimate would be developed. The charge to the consortium:

> "Design a networked system that will work with us - not against us."

The TDT's role in the design and implementation of the system was to: provide Project Management resources (i.e., work tasks, time-frames, conflict resolution); coordinate the functional requirements investigation (i.e., structured interviews, documentation); define priorities and scope of the project (i.e., determine what functionality gets implemented, and in what order); provide any existing facilities documentation (i.e., mechanical rooms, current data and telephone wiring); take an active role in the RFP process (i.e., select vendor pool and write appropriate RFPs); and define quality parameters and test criteria, and oversee the testing process (i.e., Does it meet our goals?).

Criteria for a quality system was developed to recognize that the campus network must be designed for maximum value and fulfillment of FrankliNet's goals. Therefore, the following eight criteria were established: 1) Reliability - the system should be fully operational 24 hours a day, seven days

a week; 2) Ease of use - the system should be as intuitive as possible; 3) Expandability - the system should be able to expand with number of users, number of servers, bandwidth and outside access lines; 4) Compatibility - the system should be compatible with PC and Macintosh computers; 5) Accessibility - the system should be accessible from any location on or off campus. Access to different servers should be easy yet secure; 6) Responsiveness - the system should provide acceptable response time to commands even under heavy demands of user traffic, data intensive operations (i.e., screen updates), and file uploads/downloads; 7) Maintainability - the system should be designed utilizing proven state-of-the-art equipment and software, widely used topology and protocol, and simple to use network management tools; and 8) Manageability - the system should be designed to allow system and network administrators to execute their duties in a timely and efficient manner.

STICKER SHOCK

As an exercise in developing a first look at the cost for FrankliNet, the TDT used worst case assumptions, "providing all services, to all people, at all locations, at any time." The cost developed by the consortium was three times the allocated budget. Considering this, the team began to refine the scope of the first phase of FrankliNet and establish an implementation priority based on a more frugal spending plan. Even though the operating costs associated with the new Technical Support Team were high, basic services such as, state-of-the-art workstations, a campus network, networked application software, electronic mail and access to the Internet, were within range of the allocated budget. The total cost of the first year of the three-year spending budget was 75% of the total budget.

The team determined that the functionality and services introduced the first year would remain the same for at least one year. This "resting period" would allow users to become acquainted with and fully immersed in the new network functions and features and allow support services to identify problem areas and assess the next phase in building FrankliNet.

OUR FIRST SUCCESS - PROVIDE VISIBLE AND DEDICATED SUPPORT

When the ITC Plan was being developed, the most frequently expressed concern from students, faculty and staff was support such as assistance in the planning, integrating, and assessing technology in the teaching and learning process and in business operations. The first of four elements of support was to hire an Instructional Designer to work closely with faculty to introduce technology into courses.

The second element of support was the design and development of a designated training room to provide faculty with a working model of the final network. The room has a small local area network, common software, e-mail and Internet. The stated goal of the training facility is to emulate the environment in which network users would normally operate their computer systems.

The third element was to formally train users in features and functions of the network and specific software; discuss new channels of communication and methods to be productive; listen to user concerns and suggestions and gain their confidence and trust; resolve questions, procedural and security issues; and fine-tune the system's requirements.

The fourth element of support was the Help Desk. This was a critical feature of the new system and became the central source of information and problem resolution. All of the users had DOS workstations, the new environment was expected to be intimating. Therefore, having a resource ready to answer questions alleviated many fears and smoothed the way to the day the workstations were placed on the desktops. Even with the Help Desk available, the majority of assistance was between friends and colleagues and the help they provided each other.

PRIORITY OF IMPLEMENTATION

With a project of this scale, the team adopted a student centered approach. The 75 new Pentium and Macintosh workstations destined for student labs would be the first part of the network to be installed, followed by 65 Pentium and Macintosh workstations in academic offices, and then 35 new Pentium and Macintosh workstations for administrative offices. Many of the administrative staff were given the older version workstations taken from the student labs and faculty offices. The first day of class, Fall 1995 was the target date for completing the student labs. The faculty and administrative offices would be implemented as time allowed, but completed by the start of the Winter 1996 term.

WE'RE THERE - ALMOST!

On January 30, 1996, the last computer was installed in the faculty office. The V.P. of Finance has declared FrankliNet fully operational, but not finished!

HINDSIGHT - CAUSALITY OF LONG-RANGE PLANNING

In this age of rapidly changing technology, the ability to perform long-range planning has become an art rather than a science. Therefore, the ability to prepare a well developed and thorough plan can be a detriment to cost effectiveness. At the time of implementation many types of technology and services: were either non-existent at the time the plan was developed; became cheaper soon after the plan was approved; and became overused soon after implementation. However, Franklin University would not be where it is now if these concerns had held up the planning and implementation processes. Collaborative risk taking, with trust, is a necessary quality for successful team management of technology.

The following materials are available from the author:

Franklin University, July 28, 1994. Three-Year Plan for Development of Instructional Technology Resources.

Franklin University, 1995. A Strategic Plan: 2002 and Beyond.

Giuliani, Schwarzmueller, Voight, Report to the Academic Vice President on Computer Competencies, Franklin University 12-13-93.

Integrating *Geometer's Sketchpad* into a Geometry Course for Secondary Education Mathematics Majors

Margaret W. Groman
Department of Mathematics
State University of New York, College at Oswego
Oswego, New York 13126
315-341-3030
Groman@Oswego.oswego.edu

Our Mathematics Department at SUNY Oswego offers a significant number of courses to prospective teachers, at both the elementary and secondary level. Over the years we have attempted to integrate technology into these courses where ever the technology complements the mathematics content of the courses. From the use of the computer language LOGO in courses for elementary education majors, to graphing calculators in the precalculus and calculus sequence, the department has had the opinion that technology should not "stand alone", but be used in a meaningful manner in the mathematics courses. Most recently I have been involved in the use of the interactive geometry software package, Geometer's Sketchpad and would like to report on how the use of Sketchpad has changed the way I teach the course.

In previous semesters the geometry class was taught in a fairly traditional manner. Definitions were given, theorems stated and proved and problems assigned and corrected. We did do some laboratory type activities using MIRAS, a device used to do reflections in a plane, geoboards, paper folding and of course standard ruler and compass constructions. The introduction of Sketchpad allowed us to continue these activities in a dynamic manner. For purposes of illustration I have selected three examples to explain the differences in the course, before and after Sketchpad.

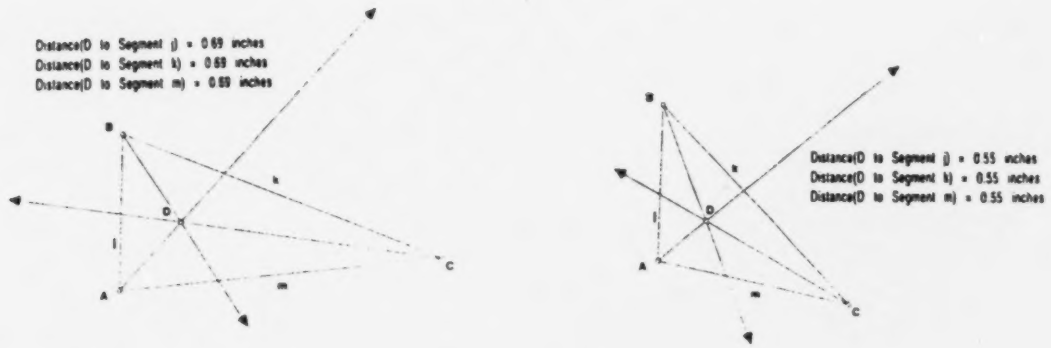
Associated with any triangle are three sets of linesthe angle bisectors, the medians and the altitudes. The angle bisector is the line that bisects one of the three angles in a triangle. The altitude is a line through a vertex and perpendicular to the opposite side, and a median is a line from a vertex of a triangle to the midpoint of the opposite side. We will consider angle bisectors first. Students can use something as simple as paper folding to discover a relationship between the angle bisectors. In triangle ABC side AC is folded over to lie on side AB and the paper is creased. When unfolded the paper crease represents the bisector of angle A. After doing the same for the other two angles the student observes that all three bisectors are concurrent, or contain a common point. Let us state this result as

Proposition 1 The angle bisects of a triangle are concurrent.

After paper folding the instructor can follow with the traditional ruler and compass construction of the angle bisectors of the three angles in a triangle. Again, the bisectors are concurrent at a point in the interior of the triangle. Even after all this, though, the student has done the construction for just a few triangles. Does the result hold in general? Are the angle bisectors of

the angles in a triangle always concurrent or did the student use "special" triangles? The software package Geometer's Sketchpad allows the students to check the conjecture for any triangle they wish to investigate after having constructed the angle bisectors only once. After first constructing an arbitrary triangle and using Sketchpad to bisect the angles of the triangle the student observes that the bisectors are concurrent. So far the technology does nothing that could not be accomplished with paper folding. But Sketchpad allows the student to click and drag on a selected vertex. As the point is dragged, the triangle deforms to different shapes. However, the angle bisectors maintain their status as angle bisectors, and their point of intersection, although changing position, still is a point common to all three angle bisectors. In the diagrams below, point C in triangle ABC was selected and dragged. The bisectors of angles A, B and C remain concurrent at point D and the proposition that angle bisectors are concurrent appears reasonable. It is so reasonable, in fact, that the next struggle is to convince the students of the need for a formal proof.

Figure 1:



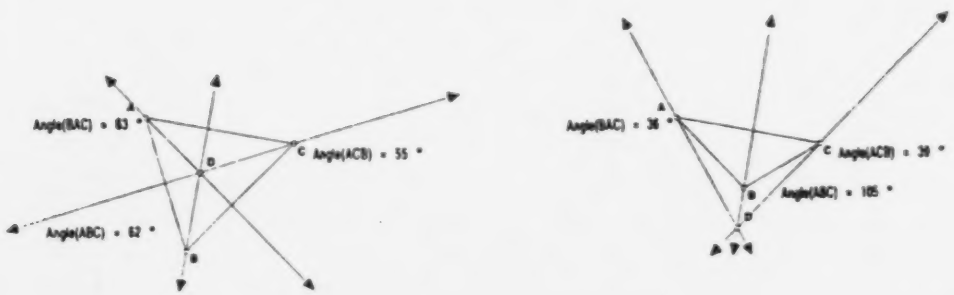
In addition, using the measure option of Sketchpad, the student can measure the distance from point D to each of the three sides of the triangle. As the above figure indicates, the distance is constant in each triangle. This observation allows the student to see a way to devise a formal proof of Proposition 1. The standard proof of this result uses a previous result - the points on an angle bisector are precisely those points that are equidistant from the sides of the angle. Thus, if point D is on the angle bisector of angle A, the distance from D to segment m is equal to the distance from D to segment j. Also, if point D is on the angle bisector of angle B, the the distance from D to segment j is equal to the distance from D to segment k. Thus the distance from point D to segment k equals the distance from D to segment m and D is also on the bisector of angle C. Hence the three angle bisectors are concurrent at point D. The use of Sketchpad has allowed the students to "discover" the proposition, test it to see if it reasonable, and even point the way towards a proof.

A similar result deals with altitudes of a triangle.

Proposition 2 The altitudes of a triangle are concurrent.

The same methodology was employed here. Paper folding gave a rough verification of the result, ruler and compass construction followed and then students were sent to the computer lab to test the result on Sketchpad. I do feel the paper folding and ruler and compass constructions are important preliminaries, in order to prepare our future teachers for classrooms that may not yet have access to dynamic geometry software. The results of a Sketchpad investigation are shown below.

Figure 2



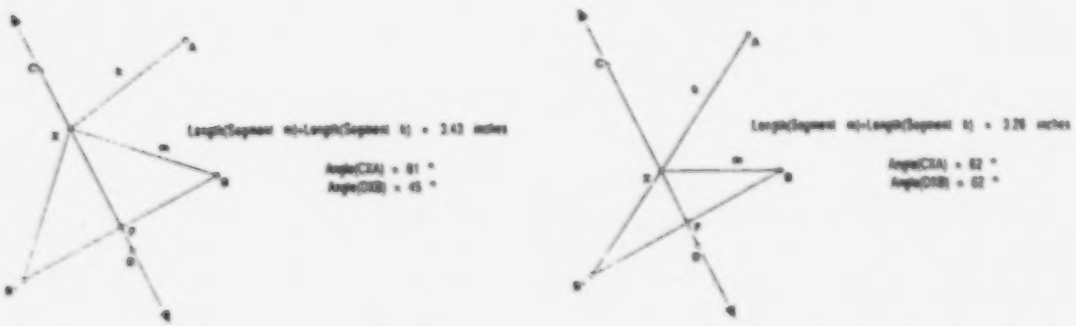
We can carry this example a bit farther than in the investigation of Proposition 1 by asking students to discover when the point common to all three altitudes is not in the interior of the triangle. This is a question that is not possible to consider when doing mechanical ruler and compass construction. With mechanical ruler and compass, the student may get lucky and do the constructions on an initial triangle where the common point is exterior to the triangle, but how will the student know what was special about the triangle? What is needed, and what Sketchpad can provide, is the ability to do the construction for a single triangle, then click and drag on a vertex to deform the triangle into many different shapes until the important characteristic of the triangle becomes clear (answerthe altitudes of a triangle intersect in the interior of the triangle if and only if all angles of the triangle measure less than 90 degrees.) In this example, Sketchpad extends the material that can be investigated.

Finally, we see Sketchpad used to investigate a result familiar to pool players. In Figure 3, students were to determine point X on the given line so that the sum of the distances from A to X and from X to B is at a minimum. Actually, in pool the problem is to find the position to bounce ball A off so that it will ricochet and hit ball B. After finding the optimal position for point X students were to print out their sketch, determine the point geometrically and explain why the position they found for point X was optimal.

Figure 3

In Figure 3 two views are shown, with two positions for point X. The view on the right is the optimal position for point X, i.e., the position for which the sum of the distances from point A to point X and from point X to point B are at a minimum. This position is found by using the measure and calculate tool of Sketchpad. As point X is moved up and down on the line the sum of the distances changes. The student simply needs to place point X where this distance sum is at a minimum. Now the problem gets interesting. What is special about the located position? How would you describe this position geometrically? How could you have found the point without using Sketchpad? Many students found these questions difficult. Some noticed that when X is in the optimal position the measure of angle CXA is equal to the measure of angle DXB. But that still didn't give a method for constructing the optimal position or a proof as to why this position would be optimal. The key comes from the material we had done earlier on isometrics of the plane.

Figure 4



Notice that in Figure 4, since B was reflected in line CD to B', line CD is the perpendicular bisector of segment BB'. Thus segment B'F is congruent to segment BF, angle B'FX is congruent to angle BFX and triangle B'FX is congruent to triangle BFX. Since segments BX and B'X are corresponding parts of congruent triangles, they have equal lengths. Minimizing the sum of the distances from A to X and then from X to B now becomes the problem of minimizing the sum of the distances of A to X and from X to B'. If X is in the position that minimizes the sum of the distances, then points A, X and B' are concurrent. If not, points A, X and X' form a triangle. Since the shortest distance between two points is a straight line, the sum of the distances is minimized when A, X and B' are colinear. Thus to construct point X so that the sum of the distances from A to X and from X to B is a minimum first reflect point B through line CD to its image, B'. Then construct a line from B' to A. The point where this line intersects line CD is the position X must occupy to minimize the sum of the distances from A to X and from X to B.

The reaction of the students to the use of Sketchpad in their geometry course was overwhelmingly positive. Many wanted to purchase copies of the software for their own personnel use and for use in their student teaching experience. Both students and instructor learned to turn to the software to test conjectures and constructions. We were able to back the theorem/proof process up a step by using Sketchpad to ask "what if" questions and the course came closer to an ideal situation where students construct their own mathematical understandings. My role as instructor changed from being the depository of mathematical truth to acting as one of many geometrical investigators.

Bibliography

Geometer's Sketchpad 3, CaliforniaKey Curriculum Press, 1995.

Musser, G. and Trimpe, L., College Geometry, a Problem -Solving Approach with Applications.New YorkMacmillan, 1994.

Serra, M., Discovering GeometryAn Inductive Approach. CaliforniaKey Curriculum Press, 1994.

Smart, J., Modern Geometries, 4th Edition. CaliforniaBrooks/Cole, 1994.

Wallace, E., and West, S., Roads to Geometry. New JerseyPrentice Hall, 1992.

1 Thirty Station Math Lab + 2 Faculty = Managing 500 Students Successfully in Low-Level Mathematics Courses

Tim Hagopian
Mathematics & Computer Science Dept.
Worcester State College
486 Chandler St.
Worcester, MA 01602
508-793-8000 X8607
Thagopian@worc.ma.edu

About Worcester State College:

Founded in 1874 and located in central Massachusetts, we are an affordable public institution. With roots as a teachers' college, we now have various majors sitting in a liberal arts curriculum. Within a few miles of and in a consortium with three prestigious colleges, a community college, and three other small colleges, we have the largest enrollment.

Full time UG students: 2849
Part time UG students: 2073
Fall 95 freshmen applicants: 2283
Accepted: 1403
Enrolled: 486
Average combined SAT score: 878 (not recentered)
Total new students last year: 1160
BA/BS awarded last year: 650
Graduate students: 583
M.Ed./MS awarded last year: 130
Matriculating UG students: 3932
Commuters: 4850 Residents:655

Majors:
Health fields: 20% Business/Econ.: 18% Social Sciences: 17%
Sciences/Math: 13% Education: 11% Humanities: 7% Undeclared: 14%

Over half of our students work more than 20 hours per week.

Mathematics Situation:

In the late 1980's and early 1990's we were not offering our credited Basic Mathematics course but many students still needed an arithmetic & beginning algebra review.

In September 1992, the president, in agreement with the chair of the Math/CS department, Robert Perry, decided that remedial mathematics and possibly other mathematics courses should be run in a non-lecture format, reasoning that such basic high school concepts should be (re)learned by doing not watching yet another teacher explain them in a cloud of chalk dust. In

order to efficiently handle the droves of students that would need the new Developmental Mathematics (MA 99) course, the decision was made to create a Math Lab.

Entering students with a math SAT score below 500 are required to either pass an assessment test or complete MA 99. All other students can take any math courses they wish but must take at least one, normally two. College Algebra (MA 110) or Business Math (MA165) are typically one of the two math courses taken, noting that MA 99 credits do not fulfill the mathematics requirement nor can they be used towards graduation.

They hired me and expected technology to be used some way. It took us a few years of semi-high tech methods and $70,000 worth of equipment to pull it all together into one smooth operation. We haven't looked back since.

***The Fab* Math Lab**

In January 1994, Worcester State College tried a new approach in the delivery of MA 99 and MA 110. In January 1995, MA165 was added. Our Math Lab of 30 Dell, 486SX-25MH personal computers networked to a Dell, 486DX-66MH file server running Novell 3.11 handles the majority of the work. After the first year we saw the need for some minimal amount of lecture, which has been in place since. A full time faculty member runs MA165 & MA110, holding a one hour lecture per week for each section (we offer two sections for each course with 65 - 100 students in each section) and the students do the rest. I am the Math Lab supervisor and also run the MA 99 class in the same format. With publisher supplied tutorial and testing software, the students can come to the lab any time to learn or to take a test. Students can make unlimited use of student lab aids/tutors free of charge. Presently there are seven lab aids/tutors, working an average of 11.5 hours per week each.

The windows based tutorials which are specific to the student's text come with a record keeping feature, giving us the ability to monitor each student's quality of work and quantity of time as well as allowing the students to leave a "bookmark". The tutorials are also available on similar work stations in the computer center for late night and weekend use when the Math Lab is closed. However, until the whole campus is networked (in September 1996, six departmental LANs and more will be networked), we must separately down load records from the computer center's file server. These algorithm driven tutorials are quite sufficient, though at times tedious especially when entering long answers. We recently offered the MA110 students 10 free points toward their chapter 4 exam grade if they did all the tutorials with success (this would take 6 - 12 hours). With only 50% of active students doing it, the raw mean for the whole class was 8 points higher than previous semesters. This and other experiences tell us that the tutorials can do the job if students spend the time although the text is still recommended especially if students do not purchase the software for home use.

The on-line testing program supplied by the publisher allows instructors to create questions or choose from a large bank of publisher's questions to build a test. At a work station, students sign themselves on to take the multiple choice tests (up to six choices per question) with the questions and answer choices appearing in different order for each student. We have set up the Novell and testing software so that students can only sign on to the proper test and are only allowed one entry into a test. Only with staff assistance can a student take any test. The test is scored instantly for the student and the result is stored on the file server. If the student wishes to know which specific questions were answered incorrectly, s/he must record particular information (from the post-test diagnostic screen) on a cover sheet (see page 76) and see then see a staff member any time after the final due date for that exam. We have chosen to keep all

questions the same for each student in order to make exact test reviewing possible. However, the algorithm driven question generator makes it possible to give each student different questions.

Many publishing companies now have the above types of on-line tutorial, testing, and management utility software packages. As we were apparently the first to use such software to such an extent (in earlier years there was only one package available), we noted many bugs and had many suggestions for needed changes. The publisher listened closely and sent continual software updates. The newest features give me the ability to: do mass student name-i.d.-password sign on, disallow students to add themselves into a course, edit student sign-on information, create practice tests on the tutorial, and attain student summary information.

Some advantages we have noted of the lab based method are:

1. Students learn *how to learn* independently by reading, studying, and *doing* problems.
2. Consistency in course coverage, grading, text, etc.
3. Flexible scheduling and self-pacing for students. Students may take a test anytime before the due date or finish the course early.
4. One to two full-time faculty positions saved. $$$$$$
5. Cheating is minimized.
6. Less "boring" or "over my head" lectures.
7. Instant test score results - nice for the students who do well.

Some disadvantages to this lab based method are:

1. More students *apparently* go by the way-side.
2. One to two less professors employed.
3. Multiple choice testing only (this is only a problem for College Algebra where partial credit would have helped differentiate cases of no knowledge & some knowledge)
4. Some students resist and don't work hard. They rationalize that they need to be "shown how to do it".
5. Instant test score results - not good for students who score very low. They often leave the lab without any consultation, get upset & anxious, and start to give up.

More!

In addition to handling the approximately 500 students/semester in the three courses, the lab also provides resources & tutoring for the college. Students not in a math course or in other math courses may use the various tutorial software packages as well as receive tutoring. Other software packages presently available include Minitab, Mathematica, Mathematics Plotting Package, Converge, and ISETL. More and more each semester, the math faculty are integrating these packages into their statistics, pre-calculus, calculus, and higher level math classes. This increased use of computer assisted instruction coupled with the heavy use of the lab by MA 99/110/165 brought about the creation of Math Lab II, located across the hall from the Math Lab, in January 1996. Containing 29 pentium work stations networked to the Math Lab server, Math Lab II doubles as a computer assisted math class room and a lab facility for students enrolled in these other courses to complete computer based assignments.

All of the math lab's software can be used in conjunction with Intel's LANSchool which allows the professor to take control of other workstations effectively forming a computer chalkboard. This inexpensive package eliminates the need for a projector when running small classes in the lab. However, for our large classes, during the first two lectures of the semester,

we benefit greatly by using a projector in conjunction with a laptop which we connect to the file server by way of a 10base-t cable installed in the lecture hall which is luckily only 60 feet away.

The Math Lab is located very close to the math faculty offices and is open M-R 8:30am - 7:30pm and F 8:30am - 5:00pm with two evenings a week reserved until 9pm for evening courses. In addition to the 24' x 27'work station area of the lab, there is a 12' x 27' room attached for tutoring, advising, and lab operations as well as another smaller room which serves as a comfortable area where students, lab aides, and faculty can interact socially.

Outside Evaluation:

Our Math discipline underwent its semi-decade, outside evaluation this past year. C Edward Sandifer from the Department of Math & Computer Science at Western Connecticut State University in Danbury, Connecticut did the evaluation. The opening six paragraphs read:

"The following is a summary of observations made during a site visit to Worcester State College on December 6, 1995, together with a series of recommendations and suggestions based on those observations. The purpose of this visit was to conduct an evaluation of the mathematics programs at the college, as part of the College's continuing process of self-evaluation and external review of its programs. The evaluation included a review of a self-study prepared by the Department, a tour of relevant campus facilities, interviews with mathematics, computer science and other faculty, a review of official College publications, meetings with students and discussions with members of the administration.

Issues are addressed roughly in order of their urgency and importance.

Assessment of the Math Lab

The way the math lab is being used to deliver remedial and introductory courses may be unique. It is certainly quite advanced and innovative and probably nothing like it is being done anywhere in New England. It seems to be working, but thus far, no effort has been made to assess its effectiveness.

I recommend an immediate effort to gage the effectiveness of the Math Lab. The simplest way to do this would be to give each student the same placement examination at the end of the course that the student takes to be placed into the course in the first place and check whether the student improves on that test.

Without doing a statistically controlled experiment, one would probably be unable to determine exactly how much more or less effective the Math Lab is than the traditional delivery technique, but the simple pre-test/post test experiment should determine whether or not the Math Lab is working well enough. Probably, if half the students who start the remedial Math 99 course finish the course, and half of the ones who finish, score well enough on the placement examination that they would not be placed into Math 99, then the Math Lab is at least as effective as traditional methods.

If the Math Lab is as effective as it seems, then the rest of the world should hear about it."

We did as he recommended. The results and other information follow. Doing a similar study for the other courses would be much harder. Although, since I have taught many courses at Worcester State College in the traditional way (including theses three courses) and before that tutored hundreds of students enrolled in these courses, I have a good sense of the effectiveness. I think lab approach works as well as the traditional for most students, better for many, and worse for a few.

MA 99:

See syllabus on page 71. I decided to try once more with no lecture - bad idea.

Fall 1995 semester results:

Of 94 students enrolled:

68% covered at least 2/3 of the material

57% covered all the material

50% received passing grades

33% passed the 30 min. assessment test which had originally placed them in MA 99:

Fall 1994 semester results:

Of 190 students enrolled:

53% passed

MA 110:

See syllabus on page 72. We feel somewhat justified in covering intermediate algebra concepts because:

1. The independent style of learning is a challenge in itself.
2. These concepts are the ones needed in preparation for either follow-up course (Pre- Calculus or Business Calculus).
3. I've tried using a college algebra text but could only cover the intermediate algebra concepts - it was too condensed and most of our students cannot handle the slight rigor of college algebra concepts.
4. We keep many of our test questions difficult - often with a "none of these" as a 5th or 6th answer choice and since "close does not count", students must be exact.

See grade distribution comparison on page 74.

Comments on student success/failure:

• Half of the data in the Math Lab distribution of grades was taken before the switch to one hour lecture/week and before any enforcement of the MA 99 prerequisite

• The College Algebra (and Business Calculus and Statistics I) classes taught by *me* in the past traditional style were typically 50% pass and 50% fail & withdraw. I believe some professors scaled too much.

MA165:

See syllabus on page 73.

See grade distribution comparison on page 74.

Comments on student success/failure:

We feel the drop in "A" grades represents a truer distribution. We are alarmed at the high percent of failing grades but like MA110, we feel these students were the "D-" of the past. The lab approach is most effective for this course probably because it is *mathematically* manageable by most students and unlike algebra, a little work goes a long way. We hear more good comments from these students

WORCESTER STATE COLLEGE

Course Syllabus **MA 99-01** **Developmental Mathematics** Spring 1996

TEXT: *BASIC MATHEMATICS/ Fundamentals, Algebra, & Geo.* 3rd ed. Richard Williams, HarperCollins 1992

This course will cover operations with: integers, fractions, decimals, percents, exponential expressions & polynomials as well as linear equations & inequalities in one variable. You will master chapters 1-9 in preparation for the many courses that use these basic skills. An underlying goal of this type of course is to develop analytic and accurate thinking skills and independent study skills (which include textbook reading).

This course will be completed through the Math Lab. Typically, you will learn the material by doing many problems (homework) in the text or, when the material is very new to you, by reading the text and then doing problems. The average student needs to spend nine to twelve hours per week doing homework. Computer tutorials should be used to supplement your learning however you may do the majority of your learning at the computer if you wish. The Math Lab is here for you; use it as often as you want. Open, less busy and restricted hours will be posted. The staff and I are available should you have any questions and you are always welcome to ask a staff member for tutoring. ***Accelerating through the course is encouraged for students who are familiar with the material.***

GRADING: Pass/Fail grades only. **To Pass you must:**

- *Pass all nine 9 chapter tests & the final with a grade of at least 70%*
- *Successfully **complete** the whole tutorial on a particular chapter before taking a retake (if one is needed)*
  See a lab aid or me when you are ready to take the retake (we will check your computer tutorial)
- *Do the above in proper sequence & timing by the dates below*

Exceptions to some of the rules above *may* be granted for an individual maintaining an average of at least 87% or in cases of documented disabling conditions.

Test Name	Deadline	Material from:
99CH1T.QM	**01/30/96**	Ch. 1
99CH2T.QM	**02/08/96**	Ch. 2
99CH3T.QM	**02/15/96**	Ch. 3
99CH4T.QM	**02/28/96**	Ch. 4
99CH5T.QM	**03/14/96**	Ch. 5
99CH6T.QM	**03/27/96**	Ch. 6
99CH7T.QM	**04/10/96**	Ch. 7
99CH8T.QM	**04/23/96**	Ch. 8
99CH9T.QM	**05/07/96**	Ch. 9
99FINAL.QM	**05/14/96**	Above

In recognition of the fact that many students carry with them mathematical fears and gaps in prerequisite knowledge (due to experiences including: gender biased instruction; attending underprivileged schools; learning disabilities &/or anxieties gone unnoticed in early schooling, etc.), I will meet with each student, upon request, affirming their diversity. Prior to the meeting, students must write about their past experiences (good & bad) in learning math, expressing what they think they know and don't know of mathematics and themselves learning mathematics. This will afford students the opportunity to reflect and self observe their lives with respect to the learning of mathematics and thereby gain enough insight to overcome anxieties and fill in the gaps.

Question almost everything but do not question what your job is right now because you have already chosen & started that job.

You are a student. You study. That's your job. Do it well.

WORCESTER STATE COLLEGE

Worcester, Massachusetts 01602

MA110 College Algebra Spring Semester

Professor: Alfred C. Johnson 1996

SYLLABUS

TEXTBOOK: "Intermediate Algebra," Lial, Miller and Hornsby, Harper Collins, 1992, Sixth Edition.

COURSE DESCRIPTION: This course will cover intermediate level algebra as a preparation for further mathematics study in precalculus and calculus. The main concepts covered include algebraic expressions, equations (linear, quadratic, rational and radical), applications, inequalities, the rectangular coordinate system and systems of equations.

COURSE PROCEDURES: This course will be completed primarily through the Math Lab. Typically, you will learn the material by studying your textbook, working on many of the problems in the assigned chapter, attending the weekly lecture/discussion in the Eager Amphitheater, completing the computer tutorials for the assigned chapters and getting help (when needed) from the Math Lab Instructor or the math tutors working in the Math Lab (S-106). All tests will be done on the computers in the Math Lab.

COURSE OUTLINE AND TEST SCHEDULE:

Material Covered	Test Name	To Be Taken By MA110 01 & MA110 02
Ch.2-Sec. 2.1-2.3 & 2.5-2.7	110CH2.QM	02/07/96
Ch.3	110CH3.QM	02/21/96
Ch.4-Sec. 4.1-4.7	110CH4.QM	03/06/96
Ch.5	110CH5.QM	03/27/96
Ch.6	110CH6.QM	04/10/96
Ch.7-Sec. 7.1-7.4	110CH7.QM	04/24/96
Ch.8-Sec. 8.1-8.3	110CH8.QM	05/07/96
All of the Above	110FIN.QM	05/16/96

GRADING POLICY:

1. Seven chapter tests will be taken during the semester. The lowest test score will be discarded from the grade calculation. The arithmetic mean of the six remaining test scores will constitute 70% of your course grade.
2. The cumulative final examination will constitute 25% of your course grade.
3. Class participation/attendance will constitute 5% of your course grade.
4. No make-up tests will be given in this course.

WORCESTER STATE COLLEGE

Worcester, Massachusetts 01602

MA165 Business Mathematics Spring Semester

Professor: Alfred C. Johnson 1996

SYLLABUS

TEXTBOOK: "Mathematics for Business," Salzman, Miller, Hoelzle Harper Collins, 1994, Fifth Edition.

COURSE DESCRIPTION: The main concepts covered in this course include review of the basics of mathematics, banking services, taxes, insurance, business statistics, wages and payroll, markups and markdowns, commercial discounts and interest.

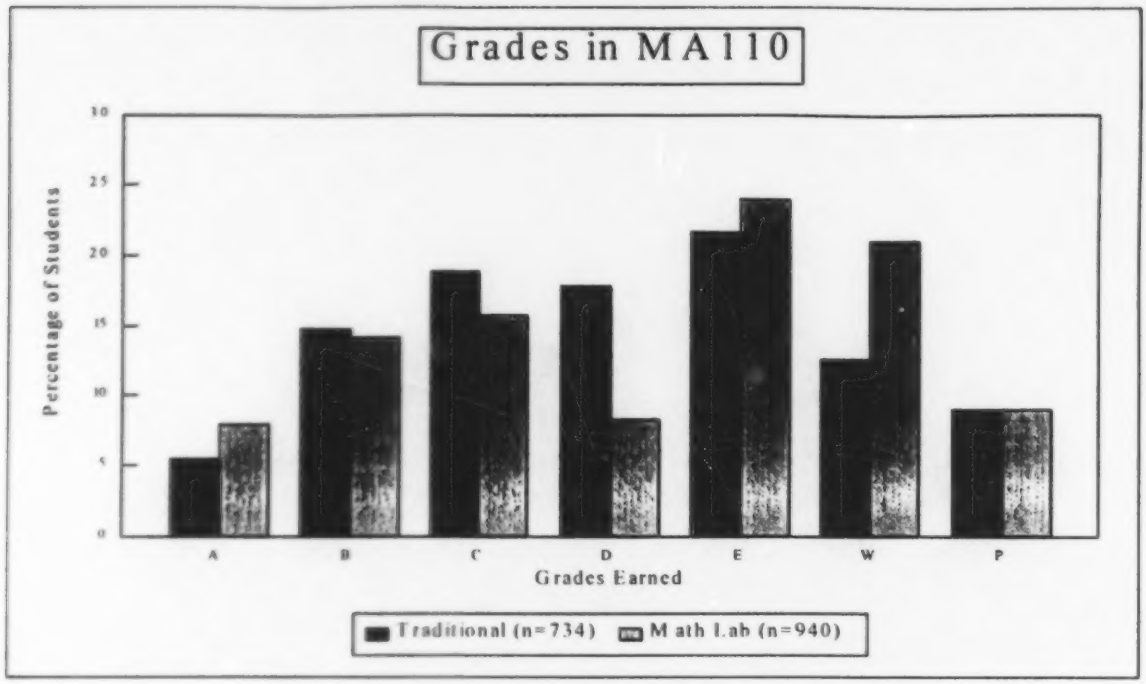
COURSE PROCEDURES: The course will be completed primarily through the Math Lab. Typically, you will learn the material by studying your textbook, working on many of the problems in the assigned chapter, attending the weekly lecture/discussion in the Eager Amphitheater, completing the computer tutorials for the assigned chapters and getting help (when needed) from the Math Lab Instructor or the math tutors working in the Math Lab (S-106). All tests will be done on the computers in the Math Lab.

COURSE OUTLINE AND TEST SCHEDULE:

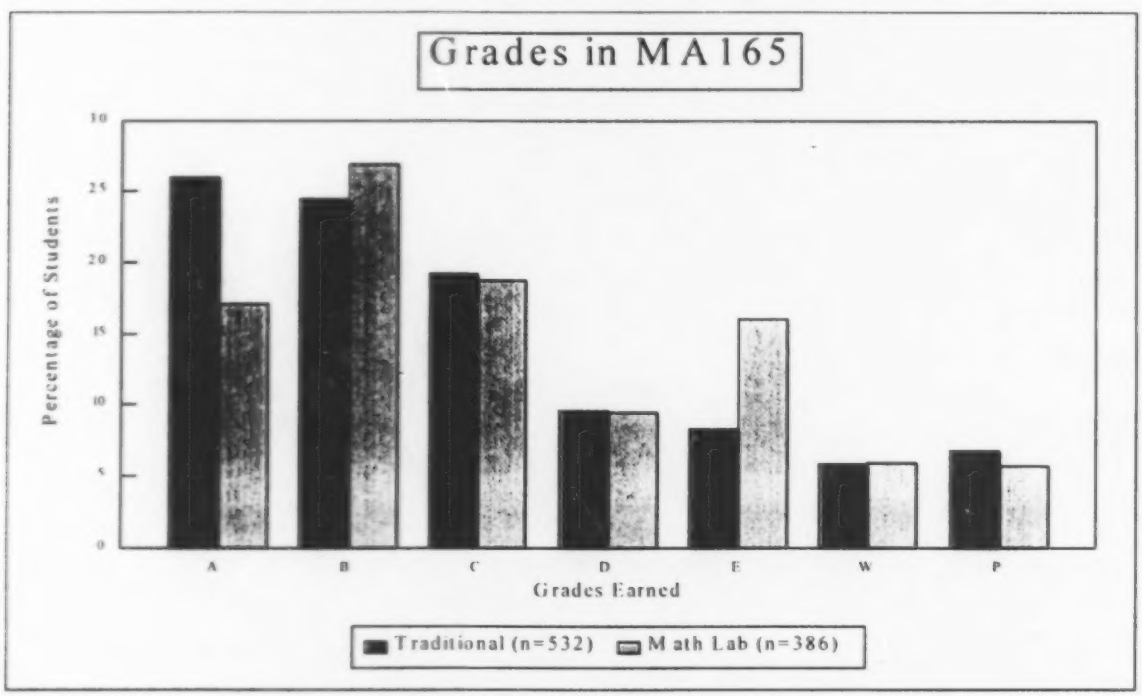
Material Covered	Test Name	To Be Taken By	
		MA165 01	MA165 02
Chs. 2 and 3	165T1.QM	02/05/96	
Chs. 4 and 6	165T2.QM	02/16/96	
Ch. 5-Sections 5.1-5.5	165T3.QM	03/04/96	
Ch. 7	165T4.QM	03/25/96	
Ch. 8	165T5.QM	04/08/96	
Ch. 9 and 10.1	165T6.QM	04/22/96	
Ch. 11-Sections 11.1-11.4 and Ch. 19-Sections 19.1-19.3	165T7.QM	05/06/96	
All of the Above	165FN.QM	05/16/96	

GRADING POLICY:

1. Seven chapter tests will be taken during the semester. The lowest test score will be discarded from the grade calculation. The arithmetic mean of the six remaining test scores will constitute 70% of your course grade.
2. The cumulative final examination will constitute 25% of your course grade.
3. Class participation/attendance will constitute 5% of your course grade.
4. No make-up tests will be given in this course.



Data taken from past two to four years from all day, evening, and summer sections taught by full-time Worcester State College Employees.



Ideas & suggestions for change :

* Limit or eliminate tutorial use on a test due date. The lab is packed on due dates from students attempting to learn all of the material just before testing and from last day testers.
* Increase lab aid and MA 99 student contact. These students need more attention.
* Increase frequency of testing. The lab is not nearly as full during weeks of no test.
* Have publisher put student names on screen at all times to facilitate tutoring, conversing, etc.
* Increase incentives for student to study.
* Increase communication about grading and that learning is the issue of concern.

Conclusion:

I think any system works well if most students want to learn and work hard or are asked to do what comes easy to them. Conversely, any system works poorly if most students don't care to learn, have weak backgrounds, don't work hard, and work an impossible number of hours at their job. The latter is our case and neither the traditional system nor the new method works *well* in my eyes. However, with further small refinements and as the students each year come to us with less anxiety about computers, our lab approach will only get better. Presently, given this type of student population in these "bad math" times, it is clear we are having relative success.

Cover Sheet

Below is a cover sheet (format altered to fit below) which students must get from a staff member before taking a test. Note: We do not *always* "turn on" the computer timer.

USE THIS WORKSPACE AND CONTINUE ON REVERSE SIDE.

[This work*space* was deleted in order to fit in this document]

After completing the test, fold here (with name showing) and hand in (with any other work). No grade may be given without this completed document and your work.

Date: _____ **Name (print):** _____

Course: (circle) **MA 99** **MA110** **MA165** **Test Name:**_____

Section: (circle) **01** **02** **E___** **Start Time:**_____ **End Time:**_____

(The computer or a lab aid will end the test at the End Time)

You are required to show all work **neatly** and turn it in after completing the test. This document must be used as a cover page for your work. Begin your work above and continue on the back. When necessary, use another blank page to finish your work. By your signature you attest that the work which appears in your name here and on the computerized test is yours and that you neither received nor gave assistance during, prior to or after the test. There is a time limit for the test; the computer may end the test after that limit. Pressing the F10 key will end your test and cause it to be scored immediately. You cannot see your *exact* test ever again. To go over your test, you must see a staff member. We have a printed copy of the test but the questions are in a different order. If your work is neat and you circle the appropriate numerals below, *we* can find a particular question as well as your errors. (These numerals do *not* match up with *your* test.)

Signature:_____ **Grade:**_____

I	II	III	IV	V	VI	VII	VIII	IXX	X
XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX

75

The WWW, Preservice Teachers and their Mathematics Courses

Pat Halpin
Joanne D. Kossegi
Mathematics Department
State University of New York- Oswego,
Oswego, NY 13126
(315) 341-2733 or 2740
halpin@oswego.oswego.edu
kossegi@oswego.oswego.edu

Mathematics, science and technology are in the midst of a knowledge explosion. Documents at the national, state and local levels are strongly recommending a new paradigm for mathematics, science, and technology education. At the national level, the National Council of Teachers of Mathematics (NCTM) *Standards* made specific recommendations for the way we should teach school mathematics. Those recommendations are now being looked at by schools in higher education. In 1991, the New York Board of Regents adopted A New Compact For Learning. This Compact sets forth a comprehensive strategy for improving public education results in this decade. In 1994 the New York State Education Department developed a new document which provides a structure for integrating mathematics, science and technology Mathematics, Science and Technology Curriculum Framework. The Framework specifies in broad terms the skills and knowledge that students should acquire, sets forth standards of curriculum content and student performance, and provides illustrations of effective teaching and assessment. In recent years the use of modern technologies has become common in the mathematics classroom. Indeed graphing calculators are mandatory in AP calculus classes. The current NCTM Standards state:

> " Calculators, computers, courseware, and manipulative material are necessary for good mathematics instruction; the teacher can no longer rely solely on chalk, paper and a text. Note however, that simply providing teachers with these materials will not produce a new program; teachers must also know how to integrate this technology into a quality mathematics program."

To change this cultural norm, teachers will need to learn new behaviors, practice them, and discover that the changes result in positive student outcomes. (Joyce and Showers 1988). Expertise development is time consuming. Studies investigating changes in knowledge and beliefs of teachers which result from teacher education programs report that lasting change occurs only after an extended period (Hollingsworth [1990], Sparks-Langer and Colton [1991]). Lappan et al. [1983] expressed similar sentiments. In their final report to the NSF on their middle school mathematics project they write as follows

> "The major implication of this study is that changing teachers' beliefs and practices require a substantial long-term staff development program. We believe that an intervention that provides less than two years of intellectual and emotional support for teachers is unlikely to have any lasting effect. Even if the staff development goals are to implement specific curriculum ideas, teachers need support through at least two rounds of working with these ideas."

Our experience with mathematics teachers in our local area is consistent with these findings. Moreover, there is generally little structure in place for significant long term staff development. Recent initiatives by various federal agencies have attempted to address this problem but of course most schools are not involved. The inherent difficulties involved with in-service training underscore the importance of ensuring that our preservice teachers enter the field with an adequate technical background.

How then should we prepare our prospective teachers in the use of modern technologies? It is not sufficient to confer technical ability on a particular topic or device. Such training is of little value unless the preservice students also learn how to incorporate this technology into their future classrooms in a sound and meaningful manner. The ability to successfully integrate new technology into one's everyday teaching style is crucial to its success. We strongly promote the idea that technology can be used as a vehicle to change the role of both student and teacher in the classroom. Students become active participants in the learning process instead of passive repositories of knowledge delivered from the teacher.

One course at SUNY Oswego which easily lends itself to the application of technology is Problem Solving. This is a required course for all secondary mathematics majors. The goals of the course include

1) to increase problem solving skills;
2) to become familiar with some of the available resources related to problem posing and solving; and
3) to learn to successfully incorporate problem posing and solving into one's teaching style.

There are many traditional resources for problems. These include problem books, journals related to the teaching of mathematics, collections of contest problems, and various magazine puzzle sections. Unfortunately, many of these sources for problems are not readily available to secondary teachers. Of course the newest and most exciting resource is the Internet or world wide web. We believe this tool will be available to virtually all secondary teachers in the very near future.

One project that each student in Problem Solving was given was to find a mathematics problem suitable for secondary students on the Web and make a presentation based on this problem to the class. Each member of the class then made individual evaluations of the presentation. These evaluations were eventually returned to the presenter. The students in this class quickly found that there are an immense number of Web sites that provide problems that are appropriate for secondary students.

The following problem is an excellent example of the type of problem that was found and used by the students in the class. We wish to thank Suzanne Alejandre for granting us permission to use her problem. The problem is to construct a 3 by 3 "magic square". A magic square is a square array of integers which has the property that the sum of any row or column is identical. They are very interesting objects which may be studied by students at all levels of ability. Suzanne gives a solution which involves a general construction scheme. The presentation which the student made on this problem was well received by the class and yielded a lively discussion.

A Math Forum Web Unit

Suzanne Alejandre's

Magic Squares

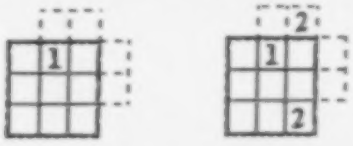
Building a 9-Cell Square

Back to Suzanne's Math Lessons || Check out Suzanne's Tessellation Lessons

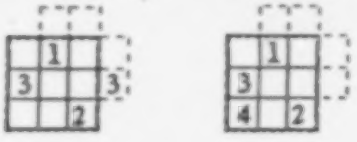
Directions:

1. Draw a 9-cell grid and place your first number in the center cell of the top line.

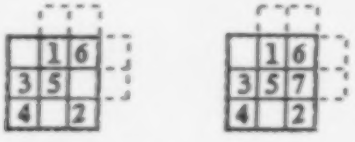
2. Extend your grid, but remember that the dotted cells are actually outside of the grid. Always work to place your numbers consecutively above and to the right: the **number 2** ends up in a dotted position. To place the **number 2** within the grid, bring it to the opposite end of the row.



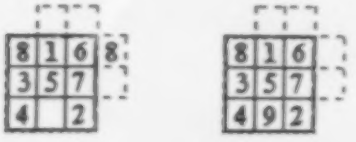
3. Place the **number 3** above and to the right. Since it is in a dotted area, it goes to the other end of the row. The **number 4** cannot go above and to the right, so drop it just below.



4. **Numbers 5 and 6** will go above and to the right. The **number 7** can't go above and to the right, so it drops below the number 6.



5. The **number 8** goes above and to the right in a dotted area - so it moves to the other end of that row. The **number 9** has only one place left to go!



Students in Mathematics for the Elementary Teacher classes were assigned to search the World Wide Web for two different sites that would be useful to them as teachers or to their future students. Once at these sites they looked for information beneficial to the mathematics community. The majority of the students had never used the Internet. After one class in the Macintosh computer lab where we accessed Netscape, they were on their own to "surf the net" in mathematics education.

Some of the sites the preservice teachers investigated were *Math Forum- Student Center, Math Forum -Teachers' Place, Geometry Through Art, Math Magic, Using Literature to Teach Math, Ask Dr. Math, K-12 Website for Busy Teachers, MathlandThe Grocer yStore*, etc. As you can see, whatever mathematical resource you need, it will most likely be on the Web. Lesson plans, book and software reviews are there too. A sample from the *Math Forum- Student Center* follows.

Elementary Problem of the Week, April 15-19,1996

This week's problem was submitted by Jody Newman, Center School, Stow MA.

Once there lived a farmer, his wife, and their three sons. When the farmer died, his will said that the eldest son was to receive one-half of what he owned, the middle son was to receive one-third, and the youngest son was to receive one-ninth. All the farmer owned, however, was seventeen horses. And try as they might, the three sons could not figure out any way to divide the seventeen horses by their fathers wishes.

"Don't worry," their mother told them. "We can solve this with a little help."

She went to the neighboring farm and borrowed a horse. Then with a total of eighteen horses, she gave the eldest son one-half, or nine horses. She gave the middle son one-third, or six of the horses. And she gave the youngest son one-ninth, or two of the horses.

"There," she said. "Nine plus six plus two makes the seventeen horses your father left you." And she returned the eighteenth horse to the neighbor.

How did she do it?

****

How does this site prove beneficial to teachers and students? The *Math Forum- Student Center* links high school students with elementary school children through the "Problem of the Week". A student who registers her response to one of these challenging problems receives a reply from a high school student who then becomes her math mentor. Both students are winners; the elementary school child gains valuable problem solving experience while the high school student, applying acquired mathematical knowledge, gains confidence in his own ability. The *Math Forum-Teachers' Place* offers teachers valuable resources ranging from the latest classroom materials to discussion groups.

It seemed to us that this initial experimentation with the Web was a success for our preservice students. In an attempt to measure our students' attitudes on the use of the Web and technology in

general we gave the following survey. The survey reflects the attitudes of a relatively small number of students and we draw no general conclusions. For this particular group it would seem that they believe that the use of modern technology as a teaching tool will have a significant and positive impact on their teaching careers.

1. The web is easy to use, even for a novice.

1. strongly agree	2. agree	3. not sure	4. disagree	5. strongly disagree
7%	**80%**	**7%**	**7%**	

2. As a future teacher, the web contains resources that would aid me in the classroom.

1. strongly agree	2. agree	3. not sure	4. disagree	5. strongly disagree
40%	**47%**	**13%**		

3. The web would be valuable to my future students if they have access to it.

1. strongly agree	2. agree	3. not sure	4. disagree	5. strongly disagree
33%	**60%**	**7%**		

4. It's easier to use a library than to use the web when searching for resources.

1. strongly agree	2. agree	3. not sure	4. disagree	5. strongly disagree
20%	**47%**	**33%**		

5. If computers are available in my future mathematics classroom, then I will make use of them.

1. strongly agree	2. agree	3. not sure	4. disagree	5. strongly disagree
47%	**47%**	**7%**		

6. I think that being familiar with modern technology will be important to my future successful teaching.

1. strongly agree	2. agree	3. not sure	4. disagree	5. strongly disagree
67%	**27%**	**7%**		

7. I think that being familiar with modern technology will be important in my successful search for a teaching position.

1. strongly agree	2. agree	3. not sure	4. disagree	5. strongly disagree
40%	**40%**	**13%**	**7%**	

8. I think that if students are allowed access to the web during school hours then they will waste too much time and learn little.

1. strongly agree	2. agree	3. not sure	4. disagree	5. strongly disagree
		47%	**53%**	

9. I think that the web will provide a valuable means for me to keep in touch with other mathematics teachers after I find a teaching position.

1. strongly agree	2. agree	3. not sure	4. disagree	5. strongly disagree
27%	**60%**	**13%**		

10. I think that modern technology will ultimately hurt our school education system.

1. strongly agree	2. agree	3. not sure	4. disagree	5. strongly disagree
		7%	67%	27%

One group of preservice students remarked"We had no idea that there was that much information on the internet. Now that we are aware of all the different activities which could be helpful to us, we will definitely take advantage of what the internet has to offer teachers." Nor did we! At this time, there are over 66,000 sites for mathematics and 11,000 for teachers. It's mind-boggling! Are they all worthwhile? That's another discussion. Here are some sites used by our students.

WWW ADDRESSES

http//forum.swarthmore.edu/students
http//forum.swarthmore.edu/mathmagic/what.html
http//forum.swarthmore.edu/dr.math/dr-math.html
http//forum.swarthmore.edu/~sarah/shapiro/ (Geometry through Art)
http//gopher.ed.gov/pubs/parents/math.mathland.html
(MathlandThe Grocery Store)
http//unite2.tisl.ukan.edu/browser/UNITEResource/Layer_Mathematics.html
(Using Literature to Teach Math)
http//www.gatech/edu/lcc/idt/Students/Cole/Proj/K-12/TOC/html
(K-12 Website for Busy Teachers)
http//www.hmco.com/school/math/brain
http//www.civeng.carleton.ca/Problems/
http//marin.K12.ca.us/~sfdhs/math/math.html
(Drake High School Math Department)

Works Cited

Hollingsworth, S. "Teacher Educator as Researcher An Epistemological Analysis of learning to Teach Reading", Paper presented at the annual meeting of the American Educational Research Association, Boston , MA. (1990).

Joyce, Bruce and Showers, Beverly Student Achievement Through Staff Development. New YorkLongman, (1988).

Lappan, Glenda & William Fitzgerald, el al. "The Middle Grades Mathematics Project, The Challenge Good Mathematics Taught Well", Final Report NSF #MDR8318218. (1983).

Sparks-Langer, G. M. and Colton, Amy B. "Synthesis of Research on Teachers' Reflective Thinking." Educational Leadership March 1991.

National Council of Teachers of Mathematics, "Curriculum and Evaluation Standards for School Mathematics".Reston, Va.(1989)

New York State Education Department, "Framework for Mathematics, Science, and Technology". Albany, NY (1994)

MSCD's DEVELOPMENT OF A CAMPUS WIDE INFORMATION SYSTEM ON THE WORLD WIDE WEB

Mary Hanna
Coordinator, Campus Wide Information System
Information Technology Department
Metropolitan State College of Denver
Campus Box 96, P.O. Box 13662
Denver, CO 80217-3362
Voice: (303) 556-5147
Fax:(303) 556-5037
email:hannam@mscd.edu

BACKGROUND

THE COLLEGE

Metropolitan State College of Denver (MSCD) is one of the nation's premier urban colleges, educating more Coloradans than any other institution of higher education in the state. Since the college was founded in 1963 as part of The State Colleges of Colorado, MSCD has grown to a current enrollment of about 17,500 students, awarded degrees to nearly 27,000 graduates, and delivered educational programming to approximately 220,000 people.

Metro tends to be "second chance" institution for a significant portion of the student body. That is, many of Metro's students arrive as transfer students from other colleges, frequently with several years having elapsed between attendance at their former college and their entrance to Metro. As a result, Metro's students tend to be older, part of the local work force, and, frequently, they attend part-time. Hence the greater need to access information at off-hours and off-campus.

Located in downtown Denver, the college shares the campus with the University of Colorado at Denver, the Community College of Denver, and Auraria Higher Education Center. AHEC (Auraria Higher Education Center) is an institution to provide common administrative services such as mailing or purchasing for 3 schools, as well as to manage the shared facilities such as a student center, telephone switch, parking space, buildings, and other facilities.

MSCD is a comprehensive academic institution, granting bachelor of arts, bachelor of fine arts, and bachelor of science degrees, offering more than 2,000 course sections during the fall and spring semesters. Students can choose from 50 majors and 68 minors offered through three schools: Business; Letters, Arts and Sciences; and Professional Studies. Programs range from the traditional disciplines, such as accounting and teacher licensure, to contemporary fields of study, such as drug abuse counseling and entrepreneurship. Unique majors for Coloradans include aerospace science, criminal justice, human services, and land use.

MSCD's emphasis is on teaching. All classes are taught by professors, not graduate assistants. The college's more than 325 full-time faculty are teachers first. Many have extensive professional backgrounds, with more than 88 percent having doctorates or the highest level of academic degrees attainable in their fields. Part-time faculty work in the metro Denver community and bring to the classroom their expertise in business, law, politics, communications, science, technology, and the arts. Small classes (the average class size is 22) ensure students greater access to faculty, a highly interactive atmosphere, and a personalized learning experience.

COMPUTING ENVIRONMENT

MSCD's administrative computing environment consists of a centralized computing environment and a client/server computing environment.

In the centralized computing environment, the host is a Hitachi Data System EX-27 with the MVS/ESA 4.2.2 operating system. Most of the existing on-line and batch administrative application systems are running on the host with data in ADABAS and VSAM files. A user can access the application systems from a PC with 3270 emulation that is connected to an IBM 3745 communication controller through the campus wide network. The current interactive voice response unit is connected directly to the 3745 communication controller with 2 SDLC lines.

In the client/server computing environment, there are a few Intel processor-based database servers and an image server. A few application systems are running on the servers with data in Microsoft SQL Server. A user can access the application system from a PC with the client portion of the application system. The network operating system is Banyan Vines 6.2 and provides mainly file, printer, electronic mail, and host access services to the connected PCs.

The college decided last year to purchase and implement a suite of administrative application products based on the client/server technology. The Banner system of SCT (Systems & Computer Technology Corporation) was selected early this year for MSCD's new administrative application systems.

In the new client/server computing environment, there will be a few UNIX based ORACLE database servers with the server portion of the Banner system and associated databases. In the client side, the client portion of the Banner system will be running on a PC with Windows operating system or on a MAC.

The Banner system will provide the interface to an interactive voice response system through a VT terminal emulation technique.

INTERACTIVE VOICE RESPONSE (IVR) SYSTEM

MSCD is operating a Periphonics VPS 7500 with 60 analog telephone lines from US West and 4 analog telephone lines from the AHEC switch.

Major IVR applications are student class registration and payment, grade reporting, financial aid information, and school orientation information. These IVR applications communicate with the application systems on the mainframe using a 3270 screen emulation technique.

INFORMATION TECHNOLOGY PLAN

A long-range plan for information technology at Metro was adopted in early 1991. This plan established a ten-year vision for information technology for the College, with emphasis in the first few years on building the network and computing infrastructure necessary to support the uniqueness of the institution. As a result of the IT Plan, a campus-wide fiber optic backbone was implemented; building premise wiring, using 10 base T architecture, was installed to link the desktop to the campus backbone; desktop computers, both PC (about 80%) and Macintosh, were procured for faculty and staff; Banyan Vines was installed as the network operating system; and a campus-wide electronic messaging strategy was implemented. This set the expectation for highly functional, user friendly, desktop applications -- the complete antithesis of Metro's mainframe-based, administrative application systems.

CAMPUS WIDE INFORMATION SYSTEM

GOPHER

I was hired in October 1994 and asked to implement a Campus Wide Information System (CWIS) on gopher. The technical services staff said they would download the gopher software from Minnesota and install it on the UNIX-based HP 9000 computer by the first of November. During that month I went looking for data to put out on the gopher. I found the College Catalog. A student doing a project for a Computer Science class had loaded the Catalog's original WordPerfect documents onto the Lotus Notes server. I spent time extracting documents, ftp'ing them to the UNIX computer and editing them to look good as ASCII text. Another source of information came from the Banyan Mail system. Staff and faculty are in the habit of sending email announcements of special events, athletic events, kudos, graduation announcements to everyone on the Banyan mail system. I would call the person sending the email, explain the gopher CWIS and ask permission to post their email. This gave me information to post and also gave some exposure to the gopher. I developed a colorful, tri-fold brochure to be sent out to all faculty and staff on campus when gopher was live on November 1. The hardest part was getting exposure. I found allies in two key people. One person, the supervisor of the student computer labs, is also the person who trains new faculty and staff in use of the computers, Banyan mail and Internet usage. He would discuss gopher and demo MSCD's in his classes. Another key person was a Program Administrator in the Student Health Center who does sexual disease awareness counseling for students. She speaks at all student orientation sessions and after discovering the mounds of information on gopher, especially the Centers for Disease Control, she would take my brochures and include them in her handouts. She also carried a stuffed gopher in her bag that she would pull out and use to introduce her discussions.

Gopher was wonderful. The software is free from the University of Minnesota. It is straight forward with its directory/menu structure. All one needs to do is save the document to be posted in ASCII text format, ftp it to the proper gopher directory, and it appears on the menu. Gopher is easy. "Non-techies" can do the work. It is also easy to empower users to post their own information. Basically, they need to be given access to "their" gopher directory and shown how to ftp a file to that directory.•

Gopher has two major drawbacks: its lack of pizzazz and its lack of hypertext capability (hypertext is the ability to select a key word and it links to another document or site). Gopher is straight text: no graphics, no bolding, no italicizing, no underlining. It gets the information out on the Internet and was great until the advent of the World Wide Web (WWW). While the number of hosts and users of the WWW has been growing at astounding rates, the number of gopher users has continually declined. However, many institutions have a large amount of time invested in gopher. Web browsers can view gopher documents so there has not been much incentive to redo gopher documents into Web coded documents. One can implement a Web server and still maintain the gopher. Do you then post some documents on the Web and some on gopher? Or post all on gopher and use the Web as a graphical front end to ASCII text documents? It is one-half of a solution. However, the gopher documents still cannot use the hypertext capability that is so useful and popular with the Web.

Another question to ask is what types of access do most students, faculty and staff have from off-campus. Does your school provide SLIP or PPP? Do off-campus users subscribe to a commercial vendor such as America On Line or Compu Server? MSCD does not support SLIP or PPP. Most of the dial in users had text-only capability and were using gopher.
The approach I used was to continue posting documents to the gopher and to develop the Web in my spare time. (The Web would be the graphical front end.) The Web was so different and fun that it was not hard to find the time to investigate and develop it for MSCD. The hardest part was continuing the gopher. As Web development started a decision had to be made as to which Web server (NCSA or CERN) to use. One of the other schools on the Auraria campus (University of Colorado at Denver) was using NCSA's and could offer us their knowledge, however, our technical staff decided upon CERN's server because Cern is where the WWW project started. •

An official MSCD home page on the Web was announced March 1, 1995. At this time I was working full time on the CWIS and had 1 part-time student helping. The student's main job duties were to "surf the Web" looking for new and interesting sites, to learn html coding, and to look for and analyze scripts for forms, free software for server statistics, and search engines. In May 1995 another part-time student was hired with the same job duties.
As our html expertise developed we found we were double posting documents: once on the gopher and again on the Web. After several months of doing this, I made the decision to discontinue gopher, post only to the Web and install "lynx" for dial-in users with text capability only. Lynx is a text-based Web browser developed by the University of Kansas. It is also free software. Users dial-in and logon to their UNIX account and at the prompt type "lynx." They see the text only version of the Web. Instead of the point and click capability of graphical browsers, lynx uses arrow keys to navigate through documents and around the

world. In October, I announced to the campus that gopher would be discontinued at the end of the semester in December. There were some faculty who were teaching the Internet through gopher and some User Support staff that voiced concern. After having them surf Netscape and use lynx they agreed to our gopher's demise.
Also at the end of the semester the Technical Services staff was shutting down the UNIX-based HP 9000 computer and moving all user accounts and software to a new DEC ALPHA machine. I decided that as long as a move was taking place we should look at changing to the Netscape server which is free to educational users. User Services staff had been installing the Netscape browser on faculty and staff PCs as the browser of choice. By January 1996 all the PCs and MACs in the student labs had Netscape loaded on them. Knowing that Netscape has a secure Commerce Server with encryption capability, I wanted us to be in a position to utilize this capability. I could picture students having the desire and capability to pay tuition and fees and admissions form processing fees on-line with a credit card number. •

ISSUES

The major problem I have faced with the Campus Wide Information System at Metro has been the lack of top level awareness. My supervisor and the Associate Vice President of Information Technology felt a CWIS was an important step for the institution. However, I asked for a CWIS Oversight Committee with high level members, including the College Attorney, representatives from Public Relations, Academic Affairs, faculty and students. This Committee is to be responsible for the top level menus, policy statements and publishing guidelines, and content questions and disputes. (As of the writing of this article I still do not have a committee in place.) I took the approach that I would continue to put information on the CWIS and continue contacting people to obtain information. If questions arose I would handle them or pass them on to the appropriate area.

With the gopher, the President and Vice Presidents knew it existed and that was the extent of their interest. With the Web more knowledge and interest have been generated, mainly I believe, because of the graphics. As an example, when the Web was installed, I wanted the President's picture on-line. User Services loaded Netscape on her PC so she could view and approve her picture. In the President's convocation speech at the beginning of the school year in August, she mentioned that she has "surfed the Web" and her picture is even on it.

Some of the main concerns and questions have been on the choice of pictures for the main College home page. College Communications/Publications has been concerned over the use and non-use of the official Corporate logo. For a while we had a picture of a historic landmark on campus -- a church. One high level administrator "heard" of the picture and without viewing the Web site suggested it might not be appropriate because we are not religiously affiliated.

Appropriate use or misuse of student home pages has generated some awareness among higher level administrators. As students develop home pages we have found one that was commercial in nature and another that was questionable as to pornographic content. These have generated discussion as to the need for policies and an oversight committee. A

committee and draft policies are being considered at this time.
Metro has purchased 4 kiosks to place at various locations on campus. These kiosks will have high level visibility. Students and visitors will be able to obtain all the campus information, plus use a phone to call an office directly, pay bills with a credit card, fax items, and print out grades, schedules, unofficial transcripts, etc. These kiosks will increase the awareness of the Campus Wide Information System.

Another issue we are beginning to face is training. As more faculty are becoming aware of the Web they are wanting to build home pages. With one full-time person and two or three part-time students it is difficult to maintain information, expand the content, stay abreast of the new developments, and train. Originally I thought if I trained some staff members they would do their home page and then could train others. It has not worked. Some staff or faculty are capable of helping others. The majority just have time and talent to get their own home page done. We have put training materials on-line. This has worked well for some people, but, again, not for the majority -- they want individualized training. This is an issue I am still trying to solve. Maybe as we create our Campus Information System and gain the awareness we are trying so hard to get, we are creating our own "monster." Or maybe it's just "job security."

The Just in Time Approach to Effectively Use Business Software in College Business Courses

Brian R. Hoyt
Business Management
Ohio University-Lancaster
1570 Granville Pike, Lancaster, Ohio 43130
614-654--6711 ext. 252
hoyt@oak.cats.ohiou.edu

...It is Deja Vu all over again!!". I don't think the great Hall of Fame Yankee catcher and baseball manager Yogi Berra had production inventory systems or business software in mind when he uttered the famous line but I have had the deja vu experience while struggling with difficulty of integrating business software into college business courses the last several years.

The images of my struggles in implementing the integration of new materials management system (JIT) into a production plant in New England in the early 1980's repeatedly flashed before my eyes. As a Division Plant Manager I was charged with untenable task of implementing a new concept in inventory management - a Just in Time system, JIT. Just in Time inventory systems totally revolutionized Japanese and then U.S. manufacturing companies like perhaps no other single intervention in recent business history. The late 1970's and early 1980's were a difficult time to be over hauling any part of your production process, especially a part that was attached to so much research and experience. Many organizations found themselves in the difficult position of intense competitive pressures (domestic and international), market shifts, and economic pressures and were not well positioned to reevaluate or change the way they did business just because some people were talking about a new Japanese inventory system. I don't think, as a young manager, I would have been ready to accept a conceptual change in how I ran my plant except I had a business mentor who was also a materials control expert and true visionary. He conceptualized the JIT system's principles and benefits years before there was information in journals and several years later patented an inventory information system that brought customers and suppliers into the information loop (call InvenSurance). That system was again years ahead of the accepted EDI (Electronic Data Interchange) models of inventory and scheduling information sharing.

The exposure to this "inventory prophet" had two significant benefits. The first was in visualizing paradigm shifts. He had the ability to envision production systems not yet in operation but if could be implemented differently would change how manufacturing processes would operate forever. The second benefit was more specific to the inherent problems in the then present materials control systems (in 1970's). I was exposed to the identification of failure causes and how those systems actually prevented businesses from responding to the intense competitive pressures many were then facing. The old inventory principles of Just in Case highlighting long production runs, stockpiled inventories, keep machinery running and avoid interruptions at all costs was ripe with incorrect assumptions and poor performance. What began as a post war production system that was need to meet enormous demand for product turned into habit later. With the cushion of prosperity all but gone this habit impeded competitive actions, the plants could not respond to new competition or new competitors.

It was only a short while ago that I saw those images, information, and subsequent action flash before me one more time, the "deja vu principle". I was experiencing first hand the same incorrect assumption and poor performance by the system of educating college business students. The assumptions were similar, the levels of poor performance almost exact, and the consequences a mirror image. The market conditions for education are changing, our ability to determine and respond to customer needs is low, our competitive leaders for tomorrow. It is because of the strong parallels in these scenarios that I am proposing similar solutions. Replace the present Just in Case preparation of college business students to a Just in Time system. Replace an aging system of education students based on a Just in Case strategy, riddled with slow response time to customers needs (business community and students) and out of control reworking of information to students. A Just in Time strategy will require students to learn and improve within a dynamic environment and best prepare for the needed impact they must make upon organizations upon graduation. A summary of the two parallel inventory systems are outline in exhibit 1 and exhibit 2.

Exhibit 1

Benefits of JIT/Accomplishments of JIT

1. Faster conversion of materials

2. less Work in Progress (WIP)
   -inventory is less, carrying cost is less, damage is less

3. reduced space and handling
   -overhead reduction, damage is less,

4. quick response to problems
   -find gaps in specifications before end of line

5. less tracking and scheduling
   -no outdating of inventory, no lost items

6. more responsibility

7. better quality
   -find waste before add value, don't ship rejected material, no need for final inspection

8. reduced scrap and rework

9. better market response/increase in market share
   -mixed model capability, more options available

10. employee pride increased

Exhibit 2

Accomplishments of JIC (Just in Case)

1. final inspection is requirement
2. bottlenecks at many operations
3. rework is out of control
4. cycle time of process is lengthened
5. high Work in Progress (WIP), raw, and finished goods inventory
6. very little interaction between employees/departments
7. no in process problem solving
8. slow response to customer needs
9. enormous tracking, data collection, and analysis needed
10. long set up times
11. poor morale, lack of responsibility and accountability

The Similarities - Production systems and Education systems

The typical effect of JIT practices on the quality of a system is in 3 major areas. The practice of reducing inventory improves the quality of a system by exposing quality problems through parts starvation. The surfacing of problems is an opportunity to improve flows through the system. The JIT practice of reduced lot size improves process feedback and reduces the potential of defective pieces. This practice also requires an emphasis on reducing set up times. Pull system support practices like synchronization or line stop capability forces attention to the solution of the process problem preventing future line stoppages.

These JIT practices relate to our education environment in several ways. Reducing inventory would be like reducing the busy work assignments, memorization, text book quizzes that may mask the problems underneath - students who can pass tests, finish all work assignments and papers but can't solve problems, think critically, work in successful high performance teams, or use business software to facilitate project planning and management, analysis, reporting or presentation of information. A cleared system that focuses on the business problem will expose the more dynamic needs of solving current business problems including new skills, attitudes and knowledge. Smaller lot sizes are comparable to project teams working on actual business problems and when there is an exposed area that students are not adequately trained to handle we must immediately correct by providing the necessary help. We then can go back to the preparation classes and include the new learning

objective, skill, or knowledge area. The line stop capability allows students to stop a project if the quality of work does not meet agreed upon expectations. Students don't need to wait until the end of a semester to get feedback or correct their work. Students now have the criteria to stop the learning experience, correct the blockage, and then move on to project completion. A summary outline of the education system as both a Just in Case system and a Just in Time system is displayed on exhibit 3 and 4.

Exhibit 3

Parallels of JIC and Business Education

1. final inspection
   -business do not "trust" degrees or institutions, increased screening of applicants in areas covered or not covered in business education process, "retraining" of many graduates within 1-3 year time period in areas other than product specifications

2. Bottlenecks
   -students continue to be slowed up in certain areas (math, finance, accounting, presentation classes, computer classes)

3. Rework
   -companies "send" employees to training sessions to relearn business principles or application areas of business concepts
   -employees go back to school (2 year to 4 year, or 4 year to MBA) to catch up to those with application experience, or gain an additional degree to safeguard against downsizing, etc.

4. cycle time is lengthened
   -taking longer to get through programs, especially of students working any type of job -2, 4, and 6 year model are still the norm after so many years

5. High WIP and Finished goods inventories
   -many students in program with no clear knowledge of where they are relative to business skills, application of key business concepts
   -as "finished goods" students wait an increasing amount of time after graduation for jobs that are desirable, or that they specifically majored in during college

6. little interaction between departments/employees
   -low skill level in team building
   -little experience in successful high performance teams
   -limited interaction between business functional areas/majors (accounting and marketing, etc.)

7. no in-process problem solving
   -students and faculty do not engage in actual problem solving activities to change their present process of learning while they under go the process together

Exhibit 3 continued

8. slow response to customer need
   -lag time between what skill, knowledge, and attitudes that business desires and what education can provide
   -students graduate and find needed expertise areas or skill areas in workplace do not match up with emphasis areas in education experience(including application skills vs. theory)
   prediction of "hot majors" is topic of surveys (although very few new products are based on surveys 5-7 years old!)

9. tracking

10. long set up times
    -no incentive to improve set up times
    -prep time for faculty drives new courses or implementation
    -major detail and time to obtain approval of program change through curriculum review

11. poor morale
    -students do not love to come to class, passion for business lost in experience

Exhibit 4

Potential Accomplishments of JIT Approach in Business Education

1. Faster conversion of materials (students or student teams)
   -will be able to move students through management principles and application in less time. If retention is higher in experiential learning projects then less overlap in subsequent classes is needed as well as more continuity between classes.

2. Less Work in Process
   -project require that professors and teams not work on outdated or lower priority information or application areas. Stockpiling information is eliminated.

3. Quick response to problems
   -the successful completion of an actual business project establishes the quality specifications and performance goals.
   -skill, knowledge, or attitude gap must be addressed immediately to complete project
   -there is no hoping to catch up later in semester, by finals, or even in another class

4. Better quality
   -If the assessment of learning is now successfully exhibiting the application of business knowledge then a student, professor , and a potential employer can have confidence that the student can duplicate that performance in the workplace now!
   -to the customer (business community) it is "right the first time"

Exhibit 4 continued.

5. Reduced scrap or rework
   -Although a project may indicate that we need to rework (go over material, software, etc.) it is done much earlier in the process, less value (time, resources) has been added

6. Better market response
   -The projects are actual business opportunities or problems so they can be as dynamic as the workplace
   -when skill or knowledge areas shift then the type of project will change
   -change the parts (skills) and routing (sequence) and introduce those skills or knowledge areas only when the student team pulls them into the project.

7. Employee pride
   -students will express pride as confidence because they know that they can exhibit the type of skills, knowledge and attitudes that business requires
   -direct application of business principles will build a cycle of success
   -successful team participation supports self esteem

A Story

Let's consider that knowledge, skills, and attitudes are the parts that go into the product represented by students or student teams. The product serves the business community needs. Learning by exhibiting skills, knowledge, and attitudes is the process. Classes are stations, professors are floor supervisors, and projects are custom orders that drive the scheduled plant/university. The JIT application is the exact intervention of teaching /learning opportunity just when student (product) needs the inventory item (skills, knowledge, attitudes).

To demonstrate this application let's account for a typical scenario between business and education. Recently an advisory board finished a brainstorming and focus group activity that was intended to highlight particular gaps in college graduates skill areas upon completion of their education. One of the business activities that the business representatives believed would sharpen up several key skill areas was the completion and presentation of an actual market survey. They believed that if students could effectively design, complete, tabulate, analyze, report, and present a market survey that they would have successfully exhibited critical thinking, problem solving ,team work, usage of business software to plan, analyze and present findings. These skills were often mentioned as important skills to demonstrate in the workplace. The education representatives indicated that they "cover" market surveys somewhere in their marketing classes but would be willing to attempt to address the business representatives ideas and suggestions. One business professor would be using a JIT approach and the other the more traditional approach (JIC) to introduce new content and skill areas.

The JIT program starts by generating a Bill of Materials (list of skills, knowledge, attitudes) needed to complete the new order (market survey project). A Routing sheet is then produced to indicate the sequence of activities and parts (skills) need to complete order.

Bill of Materials

1. research skills
2. flexibility attitude
3. interview skills
4. team building skills
5. usage of project management, Excel, SPSS, Power Point
6. facilitation and presentation skills
7. knowledge of team dynamics
8. passion to succeed as high performance team

Routing sheet

1. interview client
2. identify research objectives
3. draft research proposal
4. design survey instrument
5. determine sample size
6. collect data
7. code survey
8. enter data
9. computer tabulation
10. data analysis
11. draft report
12. present findings

Some of the parts (skills) are pre - assembled. Other project driven stations (courses) assembled these skills (i.e. team building, interview skills, flexible attitude, project planning, etc.). As the product (project) moves through the process parts are only introduced as they are needed. Perhaps the most critical part (skill) to pull into the system is business software. When the team has collected all the survey data and are ready to code the survey then we can introduce SPSS statistical software. Their need for an enabling tool actually pulls (a need will motivate team to initiate search to pull software into process) the software tool into the process. At that point the team will stop and address any problems associated with new software and the supervisor (Professor) will facilitate any resources needed to integrate this statistical package. The resources might include a hands on demonstration, custom video training tape, or other tutorials. The team moves on to the next routing step until completion of process or until another intervention is needed.

In contrast, the more traditional program (using the JIC principles) would break down the market survey activities into knowledge areas. Those knowledge areas would be covered over a 1 to 2 year course of time and perhaps never actually producing a survey, analysis or presentation at all. An internship (final inspection) might also be developed to address the business community needs. These responses would require significant set up time (course development, curriculum review, instruction methods review, textbook review, marketing, and scheduling) and "need" long runs (commitments of a 2 year guarantee for course to make, include in market research emphasis or major) to justify the up front efforts. This unresponsiveness to the business community is not intentional but can not be avoided. In addition, employers will have to "rework" those students to give them specific skills in combination with their knowledge needed to contribute in the workplace.

In 6-9 months when the business community expresses a desire to have students exhibit different skills or other activities like continuous improvement problem solving, activity based costing, or international trade their will be only one system that could handle those requests. The JIT pull system is designed for mixed models and can be flexible to handle the short set up times the business community is now requiring. Students exhibit more confidence (morale booster) because they have actually been successful at many of the workplace activities. The actual retention of skills, knowledge, and attitude areas is higher because of the experiential delivery mode. The advancing of software utilization in the workplace will demand that students not just be familiar with a couple of packages but rather can effectively use several business software applications to plan, analyze, and report during project management.

The Program Development

The Ohio University-Lancaster Management program addresses a fundamental problem in business education today: current programs are not working! Students are not prepared with the correct skills, application experiences, and knowledge to make an expected impact on the companies they enter upon graduation. In some cases, the current skills necessary to compete in a fast paced business environment (critical thinking, risk taking, team building, project management, and others) are not and cannot be addressed in the traditional delivery of business courses.

This shortfall has been identified and recognized by the business community, academic institutions, and business students. A direct response from the business community to this inadequacy of recent graduates' preparedness has been an increased investment in training and has manifested itself to middle managers in diminished competitive edge and downsizing. Students are not satisfied with opportunities after graduation and are not finding acceptable work for extended time periods. Academic institutions have many times addressed this by offering more graduate programs, used to "catch up" students in critical decision making areas and other executive training areas.

The basic activities of all students in the Ohio University-Lancaster Business Management program directed by project based learning. We will increase the iteration of problem solving and market opportunity assessment and focus on the dynamic and changing skills needed to contribute in the workplace. The direct and constant contact of real business problems with actual entrepreneurial organizations require exhibition of lower level skills at first, then advancing to higher level decision making skills. This will better prepare students to identify, assess, and evaluate actual organizational requirements and move specific projects through to successful completion. The culmination of these project experiences will involve a team internship with a local or regional company.

The intended outcomes are very clear: to more effectively serve the entrepreneurial business community, business education's important external customers, with more effectively and correctly prepared business practitioners. These students will contribute with passion and sound business principles to the task of repositioning organizations' competitive positions in respective industries.

The logistics of making this plan a reality requires two significant information delivery mode changes. The first is to put students into a comprehensive and fully integrated business project based curriculum. The second is to change the process that students use to bring in a "parts inventory" of skills, attitudes, and knowledge just in time for them to utilize those "parts" to successfully complete their business projects. A critical "part" that must be introduced into the process is the application of business software. The following sections in this discussion will move from problem description to solution alternatives and finish with a logistical outline that supports the integration of business software into college business courses in an effective Just in Time approach.

Problem Statement

The United States business environment faces a critical crossroads on the well traveled road to competitive edge: in product development, market development, technology, market share and profitability. There are fewer frontiers in which companies can take control and show leadership. The rivalry is increasing across the globe, and one resource has been increasing in its value. This

resource can impact the kind of change to take the U.S. on the high road to continued dominance in some markets, regained prominence in others, and once again be a model for all industrialized and emerging nations.

This key resource is clearly our people , our human resources. The U.S. Department of Labor's 1991 Secretary's Commission on Achieving Necessary Skills (SCANS) recognizes this issue and reported that "the qualities of high performance that today characterize our most competitive companies must become the standard for the vast majority of our companies, large and small, local and global. By high performance, we mean work settings relentlessly committed to excellence, product quality, and customer satisfaction. These goals are pursued by combining technology and people in new ways. Decisions must be made closer to the front lines and draw upon the abilities of workers to think creatively and solve problems. Above all, these goals depend on people -- on managers committed to high performance and to the competence of their workforce and on responsible employees comfortable with technology and complex systems, skilled as members of teams, and with a passion for continuous learning."

The business world's trouble translates into a very clear problem for all undergraduate business programs today...they do not work!

College graduates have little impact on the organizations they enter, especially when we consider that they have years of training and significant dollars invested. Their functional expertise is often limited to just one area (accounting, marketing, finance, etc.) with almost no integration experience within the disciplines. In addition, they are unable to apply their textbook "rules" to the workplace and need major socialization in business principles and the normal corporate culture. The end result is the need to provide actual retraining for those new employees who still show some potential. Others are not deemed "savable" and are let go or are allowed to drift until and organization's financial constraints intensify and searches for non-contributors begins. This scenario is heightened as the organizational dynamics of start-up organizations increase. They require a more broad based expertise in business functional areas and entrepreneurial ventures typically have less time or resources for retraining efforts. Expertise in theoretical knowledge without application skills severely weakens the new graduate's potential.

Our Distinctive Approach

The first area of distinction is the manner in which we have planned to address the "skill gap": re-identify our customer. This perspective or frame of reference is not to be taken lightly. We have determined, then supported with actions that an undergraduate business program has a distinct customer: the business community. Most other schools have designated the business student as their customer. The remaining small percent of schools, who also state the business community is their customer, often are just giving lip service for promotional reasons. The real distinction is in supporting that statement, because if the business community is the customer, then they should determine the specifications, quality levels, service requirements, and "product" development parameters of the product -- the student. If business is not tied to the process, then they are not the customer in practice. With competition in all industries (including education) growing more intense, there has been feverish activity to "re-connect" to our customers. The quality movement in which we are now entrenched is a direct result of customer satisfaction. Again, the real distinction between

the OU-L Team Project Internship and traditional programs is in its application, its focus on real time problem solving on "live" projects and activities. This environment becomes an approach to customer satisfaction (student skills = business needs) that is dynamic and changes as the business environment changes. This is much like the quality area's continuous improvement. Traditional programs are not ignorant to the customer identification dilemma; they choose to ignore it because they must be careful what they aim at. They just might hit it! To allow this new customer to directly participate in program objectives will require diminished autonomy, authority, power base, and perhaps a major shift from their own core competencies...welcome to the world of business.

The second area addresses techniques, methodologies, and deliveries. The traditional classroom format (including more progressive technology usage, collaborative teaching methods, etc.) is not equipped to teach these newly identified skills which businesses require (risk taking, project management, listening, change management, etc.). Current efforts are largely limited to case studies, simulations, and internships. While these help in exposing students to business situations, each has serious flaws. Case studies, by definition, are focused on the past. Simulations tend to be clinical, and participants have nothing to risk while most traditional internships are one dimensional, not integrated, and activities are predetermined -- unlike the workplace. Other efforts to address the problem have focused on updating textbooks. New chapters and even a course has been added to such areas as ethics and environmental issues. Jeffrey P. Sudikoff, founder, chairman and CEO of IDB Communications Group heads a $400 million company headquartered in Culver City, California. He recently noted in *Inc. Magazine* (March, 1994, p.23) that he was asked to teach a class of business students on how to become entrepreneurs. The task was too difficult. His response was clearly critical of traditional classrooms. "The very idea! You cannot teach drive, or initiative, or ingenuity or individuality. You cannot teach in a classroom the lessons learned by starting a company with nothing more than hope and the ability to talk a bank officer into giving you a loan." If not in our classrooms, then how? And where? The answer and solution are in a project based, real time environment. If the application of theories and principles and the newer skills can only be seen, understood, and tested in the workplace, then we had better move the classroom closer to the environment. A comprehensive project based curriculum/program will require the understanding and usage of relevant knowledge and expertise. The real time nature of projects will eliminate the expended time lag between the receipt of theoretical information and its implementation in solving problems. Continued project participation will eliminate the present outcome where students reach the work world rusty in application skills and theoretical knowledge. Quality professionals, in their quest for continuous improvement, require process testing to simulate toughest conditions that their products are likely to encounter. Wow! What a concept for business education as well.

The third area (a hurdle for even those schools desiring change) centers on the environment. As in all fields, the best business students tend to make their own opportunities and may succeed in interacting on a variety of levels with businesses during their college years. However, these are exceptions, and most owe their exposure more to their own creativity than to the educational system. The real challenge is to create a system that prepares graduates with not only the theoretical knowledge necessary to get a job but also the application skills necessary to make a difference when they get there. The system must address two specific areas: how do we put larger numbers of students in real projects with businesses and not interfere with the success of that project, and how do we guarantee that when students are working hand in hand with business in a live learning environment to which they are correctly prepared to contribute. We must prepare them so that they

can learn, practice, and make a positive contribution.

The Program Solution - Ohio University-Lancaster Team Project JIT Approach

The Ohio University-Lancaster Team Internship is a program designed to be a progression that will first expose students to actual business activities in smaller problem solving components. From there, the program will increase students' involvement and repetitions in problem solving and the continuance of developing specific decision making and leadership skills. The final stages of students' experiences will be used to effectively apply their expertise gained through the preparation of experiential team projects. The actual on site team internship is the culmination of very targeted project based learning environment. Each member of the team has been involved in several classes that have been specifically designed to ready the interns to function as a team for our client and to hit the ground running in the problem solving and decision making activities. In many cases students will be familiar with the company and some of its problems/opportunities because they have been working on smaller components in previous project based quality classes. The final project based class is the Team Project Internship and will be a four credit field experience with a designated company.

The OU-L Team Internship has five foundation principles: 1) project based curriculum; 2) multiple iterations at varying and increasing levels of expertise; 3) handles larger numbers of students in program; 4) program is driven by continuous improvement quality skills and strategy; 5) introduces business software during project applications through JIT pull system.

The rationale for project based curriculum and hands on activities has been adequately addressed; the format for these projects will be discussed along with the quality emphasis. The need for multiple iterations of problem solving within a team on an actual project is a practice makes perfect strategy. The dynamics and skills necessary to complete actual business projects needs to be developed to maximize an exciting field experience with a regional company. We are committed to providing our internship companies with student teams who have had a series of successful practice opportunities in making complex business decisions. Spreading the project experience of a 3 to 5 set of courses culminating in a field internship exposes more students to this exciting opportunity and provides needed training. The team internship, although reducing the number of businesses with whom we can work, does provide a more realistic experience and increases the probability for success for all participants. The delivery of these project based classes is within a newly developed and introduced Quality Specialization within the Business Management Technology program.

We designed a curriculum paradigm which identifies a five set course bundle, has student performance objectives, expected excellence outcomes, and an effective assessment plan. The most important aspect of this specialization is that it is five classes that are team problem solving based, actual business project driven, hands on learning environment, where students are exposed to and required to exhibit certain skills, attitudes, and knowledge areas. The vehicle that we use to integrate these skills with the projects is the continuous improvement cycle of problem solving and decision making. We provide training in the use of a full range of quality tools, team facilitation training, and presentation strategies. Again, the last project class will be an experienced team undergoing a field internship with an entrepreneurial company.

Our last foundation principle addresses a significant potential barrier in the workplace as well as in the classroom. We must be able to effectively introduce and use various business software packages. For business students, the problem focuses on two areas. The first area involves the use of computers and business software directly. Typical business curriculum would require a computer class or perhaps two that usually is taken by students months and even years before they enter into their business major classes. This push system is not working; retention and keeping up with the upgrades interferes with both student and faculty as they attempt to keep up with the dynamics of their own business discipline.

The second problem area is in the overall curriculum design. Making decisions on which manufacturer's software to use can be a guessing game at best. Successful production inventory control systems require parts to be delivered only as they are needed using the Just In Time (JIT) system. The successful integration of computer usage and software expertise can emulate the shop floor models. The issue is Pull vs. Push. Pulling the software into the classroom at exactly the time business students need those enablers optimizes the benefits of experiential learning project work and increases the application of various business software. The Pull method of integrating software into business classes is driven by the actual business project. What type of enablers are needed to successfully complete the project is the significant criteria for what should be taught (i.e., spreadsheets, project management, statistical process control, SPSS, flow charting, activity based costing, business simulations, and others). When it is needed is determined by the immediate needs of the student project team. The introduction of the tool (enabling business software) is only presented when a student or team is ready to apply it in a problem solving situation or for project activities. The logistics of introducing the tool may include one or a combination of the following deliveries: training videos, software design demonstrations, customized screen cam-type videos, interdiscipline "consulting" sessions with Marketing and MIS professors, or sessions with business practitioners from project partner organizations. These five foundation principles, we believe, will best prepare internship teams for more dramatic experiences and more effective results.

C-CUE
A Regional Consortium in Action

William J. Creighton, Director
Academic Computing Services
Indiana University of PA
Indiana, PA 15705
Phone: 412-357-2975
BITNET: CREIGHTN@IUP
Internet: creightn@grove.iup.edu

Daniel Faulk
Director of Administrative Computing
Washington and Jefferson College
60 South Lincoln Street
Washington, PA 15301
Phone: 412-223-6514
Internet: dfaulk@washjeff.edu

Frederick Jenny
Chairman, Computer Systems Department
Grove City College
100 Campus Drive
Grove City, PA 16127-2104
Phone: 412-458-2071
Internet: jenny@boaz.gcc.edu

INTRODUCTION

The Consortium for Computing in Undergraduate Education, Inc., is a regional association of colleges and universities committed to developing and expanding the appropriate use of computing and other information technologies in undergraduate education.

Consisting of 19 colleges and universities in western Pennsylvania and West Virginia, the Consortium promotes networking among its members and provides mechanisms for sharing information, expertise, and other resources by organizing and supporting workshops and seminars, providing references to consultants, providing a forum for collaboration among its members, negotiating with vendors, and publishing an educational computing newsletter.

The Consortium's goals are to promote and provide ways for faculty to develop expertise in instructional technology, information and support for Academic Computing staffs, information and support to college administrators charged with making decisions about using instructional technologies, the exchange of information about educational computing and other instructional technologies among the members, professional exchange and collaboration by the member's faculty and staffs, and access to equipment and software through purchasing contracts negotiated with vendors.

BRIEF HISTORY

The Consortium for Computing in Undergraduate Education, C-CUE, began in the spring of 1984, when the Claude Worthington Benedum Foundation awarded a grant to Carnegie Mellon University. The purpose of this grant was to provide staff support for a group of fourteen colleges interested in developing academic computing. The project, entitled the Benedum Regional College Computer Enrichment Program, held several seminars at Carnegie Mellon and a series of discipline-based software workshops at the participating colleges. A monthly newsletter was also established. These activities were the effort of faculty representatives from the participating colleges and the administrative staff at Carnegie Mellon University.

In December 1986, the Claude Worthington Benedum Foundation gave a second grant to Carnegie Mellon University to establish an association for academic computing. The group named itself The Consortium for Computing in Undergraduate Education; C-CUE. The Governing Board adopted a set of bylaws in the spring of 1987, which now serve as the operating guide-lines for the Consortium.

While the relationship with Carnegie Mellon had proven fruitful from the membership, the original intent of the organization was to become self-supporting. To that end, C-CUE decided to become an independent organization. In 1992, C-CUE incorporated, and soon thereafter, obtained non-profit, tax exempt status. C-CUE, as an organization, now draws its strength from the collaboration between the member institutions.

MEMBERSHIP

The primary benefit of belonging to C-CUE comes from the sharing of information. It is generally a comfort to have opportunities to discuss ideas or problems with a friend or group of friends with experiences in like situations that they can draw upon. C-CUE provides such a group of friends and organizes them into a community bound together by similarities in the mission of their institutions and a common interest in using technology to address the educational mission of those institutions. Having an opportunity to discuss issues of technology in a non-threatening, supportive environment such as this can provide value far beyond the cost of membership.

No member of C-CUE comes to the group with special rights, privileges, or entitlement. Each member comes expecting to find new ideas for solving problems they may be experiencing or simply looking for ideas about how others are using software in the classroom. Common practice is to have a quarterly meeting organized around these themes or any other topic of technological interest or benefit.

Membership in C-CUE has its obligations. The consortium is a self-supporting, member-operated, non-profit organization. Membership fees are low. Continued operation in this manner requires commitment on the part of member institutions. Specifically organizational governance, encouraging participation by faculty, and a willingness to host organizational events are important contributions made voluntarily.

MEMBERS

Currently there are 19 member institutions in C-CUE. Those institutions are: Bethany College, Chatham College, Davis & Elkins College, Edinboro University of Pennsylvania, Gannon University, Geneva College, Grove City College, Indiana University of Pennsylvania, LaRoche College, Mercyhurst College, Saint Vincent College, Salem-Teikyo University, Seton Hill College, Slippery Rock University, The University of Charleston, Washington & Jefferson College, West Virginia Wesleyan College, Westminster College, and Wheeling Jesuit College. These colleges and universities range in size from quite small to mid-size. Some are located in very rural areas, some are situated in very urban areas, most are located in more of a small town environment.

All institutions from West Virginia, western Pennsylvania and eastern Ohio, whose primary interest is in undergraduate education, are invited to apply for membership in C-CUE. Membership is maintained on an annual basis; the fiscal year starts on July 1. The initial membership is for two years, and the current membership fee is $250.

ACTIVITIES and PROGRAMS

Members of the consortium collaborate on a number of activities that are intended to provide general benefit. It is, for instance, important for each member institution to have a viable access to electronic mail. Cooperation of member institutions willing to act as hosts for other consortium members allowed a number of schools the opportunity to become active in the use of email far sooner than could have been the case if they had not been C-CUE members.

The attitude within the consortium is quite familial. Open sharing of knowledge and expertise is possibly the most valuable benefit for many. Knowing who can be contacted for response to a specific question is facilitated through publication of a resource directory. Sharing takes place in other ways also. Sometimes it is important to know which vendors are worthy or unworthy of your trust. Other times all members can benefit by negotiating an improved purchasing arrangement with a vendor as a group rather than as individual institutions. Information about site licensing, educational discounts and related vendor relations is compiled and provided to governing board representatives to assist with their campus purchasing decisions.

A free subscription to the Consortium newsletter, On-CUE, is provided for each institution. A copy is e-mailed to all governing board members who make it available to interested parties on their campuses.

MEETINGS

C-CUE meetings and workshops are concurrently held four times each academic year; October, December, February and March. C-CUE board members and interested faculty from member institutions are invited to all sponsored events.

The October, December and February workshops each focus on a specific discipline. Workshops are normally divided into morning and afternoon sessions. The morning session is generally a presentation on how technology can be used to enhance instruction in a particular

academic area. Such topics as business, writing, education, physics, art, biology and mathematics have been presented recently. In fact, over the last ten years, workshops have been held in nearly every major discipline. A general session to advance the awareness on a relevant topic for both guests and governing board members is also typical.

During the afternoon sessions, faculty members have the opportunity to explore the workshop topic in greater depth, usually from a "hands on" perspective. At the same time, board members conduct their quarterly business meeting. These meetings follow a standard form of old business discussion, reports from program chairs, and discussion and action on new business. Specific topics of business are handled at particular meetings. For example, officers are always elected during the December meeting, workshop topics for the following year are decided at the February meeting and membership dues are reviewed and set at the March meeting. From time to time, special workshops are sponsored in addition to the regular workshops. These special topics have included using the World Wide Web, writing HTML files, and developing network infrastructures.

The agenda from a recent quarterly meeting held at Washington & Jefferson College demonstrates a usual format:

AGENDA

9:00 - 9:45 Registration and Continental Breakfast
The Commons Lounge

9:45 - 9:55 Welcome message
Dr. G. Andrew Rembert
Vice President and Dean of the College
The Commons Lounge

10:00 - 11:50 Biology Workshop - Morning Session
Dieter-Porter Hall

12:00 - 1:00 Lunch
The Commons Lounge

1:15 - 3:30 Biology Workshop - Afternoon Session
Dieter-Porter Hall

1:15 - 3:30 C-CUE Governing Board Meeting
The Commons Lounge

Host workshops and presentations are among the most enjoyable and rewarding opportunities offered by the consortium. Each governing board meeting is held at a member institution. A previously determined and agreed upon theme for the meeting serves as a workshop focus. Members, either the host or others, then arrange a series of presentations on the topic chosen as a theme. Attendees benefit from the sharing of information. Presenters benefit from professional fulfillment. Generally the workshops are the main attraction at each quarterly meeting.

The following represents topics that have been featured at workshops at various institutions:

On Computing in the Curriculum
- Business, Economics & Accounting
- Chemistry, Biology & Health Sciences
- Pennsylvania Association of College Chemistry Teachers Software Fair
- Writing in the Curriculum
- Computing in Teacher Education
- Computerizing a Writing Program
- Teaching Math with Computers and Calculators

On Issues and Policies
- Issues in Computing in Liberal Arts Colleges
- Meeting the Challenge: Integrating Computing into the Curriculum
- Resources for High-Risk Students

On Information Technologies
- C-CUE/PRLC Library Automation Seminar, Pre-Conference Session: The Library and Academic Computing.
- C-CUE/PRLC Library Automation Seminar, Post-Conference Workshop on Multimedia
- Desktop Publishing
- Strategic Network Planning
- Tools for Scholars

For Administrators & Support Staffs
- Current Directions in Information Technology, presented by CAUSE
- Silicon Basement Seminar: Planning for Effective Computing in the Curriculum
- Networking in the Independent Colleges

The March C-CUE workshop is always a jointly sponsored event with The Council of Independent Colleges (CIC), Educom and CAUSE. The four organizations together, with CIC as the lead organizer, host the annual Information Technologies Workshop in Pittsburgh, Pa. Representatives from more than 130 colleges and universities across the country attended the 7th annual event in March, 1996. This year's workshop sessions included multimedia classrooms and media distribution, the educational vision of the Internet, telecommunications integration, and student learning with today's technology. The March C-CUE board meeting is held immediately after the workshop is concluded.

SITE ASSESSMENTS

When requested, the Consortium conducts assessments of computing environments at undergraduate colleges and universities. The assessments are designed to produce a focused picture of the computing facilities at an institution, what access faculty, staff and students have to these facilities, the ways and the extent to which computers are being used in academic and administrative departments, and the extent to which computing planning and support mechanisms are in place. Where deficiencies are discovered, recommendations are made and alternatives are suggested.

The assessment is composed of three parts. There is first a comprehensive questionnaire to be completed by members of the administration, staff, and faculty, and returned to C-CUE along

with a copy of a recent academic catalog. Second, a three or four member team conducts a two-day site visit at the college to view facilities and discuss the role of computing with faculty members, administrators and staff. Students can also be interviewed at the request of the institution. And thirdly, the collected information is analyzed, and a written report prepared. Copies of the completed report are typically sent to the institution's president and chief academic officer. The assessment team will be prepared to present preliminary findings to those officers or to another designated person or group at the end of the second day of interviews. The completed assessment report is sent within 30 days of the site visit.

Typically C-CUE does not assess the suitability of specific computer applications programs in the academic programs of individual departments. The use of computing in academic programs at an institution is compared to national trends in academic computing. The typical cost of the assessment for member institutions is $0.50 per FTE student, plus travel and related expenses for each assessment team member. C-CUE pays the expenses of the team members, then includes these expenses on its itemized invoice to the institution.

CONCLUSION

C-CUE has become a valuable asset to its member institutions. The collaborative work of the Consortium has elevated the understanding and uses of technology in classrooms across member campuses. By simply sharing information and resources, faculty members have become aware of new and beneficial ways to appropriately incorporate technology into their courses, which in turn, directly benefits students.

The information shared at the quarterly meetings, through workshops, and by email provides an important perspective and regularly influences decisions. The single most important benefit for maintaining institutional membership in C-CUE may be the opportunities that exist for getting sound technological insight and advice from trusted colleagues. While advice can be found in many places, sound advice which can be gathered and gained from a trusted group of friends has a value beyond price.

Note: Additional information about C-CUE is located at C-CUE's Web site: www.c-cue.org

Creating an Undergraduate InfoTech Major

Harold H. Kollmeier
Associate Professor
Computer Science and Information Technology
Franklin Pierce College
Kollmeier@rindge.fpc.edu

At Franklin Pierce College, a small, independent liberal arts college in rural New Hampshire, many think we are lucky to have computers at all, let alone majors and minors in Computer Science and other versions of computer-related education.* But there has been development in this area for some time at the college. A Computer Science program has been in place for four years, which was preceded by a technology-related program in the Business Division. The Computer Science major has been one of the smaller ones at the college and development of new courses has been limited by technical resources, but we have a certain staying power. We also have strong mass communication and graphic communications programs, which have their own technology- related courses. Other majors also use technology and have computer-related courses. We have therefore been, in our own small way, "robust."

There has been a growing awareness, however, that all of our students' needs associated with technology are not being met, and that all of the talk at the college of developments in technology have not been reflected in courses and programs. It is also true that "Computer Science" as a discipline does not respond to the needs of those student who are interested more in applications development than in research, and that other disciplines that use technology do not have comprehensive programs in the field. We therefore face a dilemma that derives from our own internal need for growth as well as changes that have occurred in the technology industry itself. Technology keeps changing, and our response must also change.

We have therefore embarked on a new program in what we are calling Information Technology. It is not going to be all new, however, because of budgetary restrictions and also because we have already been doing much of what is needed, albeit for other purposes. However, it is already clear that new directions are going to be taken by this program, not only in content, but also in the ways that we as an institution plan for the future

The developments at an institution reflect the history of the institution, and the newly implemented program attempts to make use of three established disciplines - Computer Science, Graphic Communications, and Mass Communication - to conform more closely to the reality of technology in the late nineties. Information Technology brings together tools from these disciplines for the implementation of well designed, robust electronic communication. It represents the continuing convergence of technology in the communications and computing fields.

The new IT major consists of a set of nine core courses, taken from already developed courses in Computer Science, Mass Communication and Graphic Communications. It includes computer literacy as well as graphic design. It includes data communications but also media policy and economics. All of these are appropriate areas of study for someone in Information Technology.

because technical as well as conceptual and managerial expertise are necessary. Beyond the core three electives are required, and these will come from a large group of other courses, not necessarily limited to the three "parent" disciplines.

And IT ends up being different from the parent disciplines. It is different from Computer Science in that it is not interested in development of emerging technology so much as it is interested in the rich implementation of emerged technology, and its focus is more on connectivity than on the individual machine. It is different from Mass Communication because it is more technology-driven than Mass Communication in general. In a sense IT is a subset of Mass Communication; but it is also qualitatively different in than Mass Communication traditionally concerns itself with reaching the largest number of people possible, whereas IT focuses on reaching individuals with advanced technology.

It is different from Graphic Communications in that it is an extension of that field, based largely on the shift of the methods in the field because of new technology, for instance, the digitization of photography. But you don't just change the technology and do the old thing: the change demands creative new approaches to old problems.

Information Technology will allow students to develop an understanding of new ways of communication, which include issues of media and computing. Areas of concern include graphics for broadcast and cable television, graphic art for promotional and marketing tools for the advertising industry, animation for film and video, special effects for video and film, and animation for video games. It is a new field that has growing interest among potential students, and it seems that there is little development at the moment in this area. The time is therefore ripe to start this program.

Because the program reflects the history of the institution, an IT program at another institution will probably look quite different from the one at Franklin Pierce. Certain paradigms perhaps emerge here: the IT program at a liberal arts college, the one at a large research institution, the one at a community college, the one at a technological institution. They might come to be quite similar, however. Our own present plans call for new courses that will be IT courses, not borrowed from other programs. This includes a course in multimedia, for example. If this type of development becomes stronger, the different kinds of programs will grow to be similar.

While new courses will be needed, at first only four, easy- to-implement additions to the curriculum are planned. The first is a new freshman course, IT102 Information Technology. This course builds on the introductory knowledge gained in CS101 Introduction to Computers, our popular version of the computer literacy course, and expands that knowledge to include issues in graphic design and mass communications. We will do this through hands-on development as well as reading and discussing subjects in the field. Databases, Internet, including World Wide Web, HTML and Home Page development, information technology tools and formats, multimedia, the platform issue, non-linear audio and video editing and graphic animation, and product evaluation: these are all topics for the course.

One of the interesting aspects of this course is that no one of the present faculty at the college is capable of teaching it. It is quite possibly true that very few faculty at any college in the land could cover this material in the traditional way. Both excited and challenged by this, we are therefore

faced with a team effort, and each member of the team will hopefully learn the alien materials of the course in time to teach it independently next time around.

The next course is IT390 or 490, Internship in Information Technology, which will provide the opportunity to gain experience in the technology development of profit and non-profit organizations. The internship is taken after most of the major or minor requirements have been met, and in no case before the second semester of the junior year. An agreement is drawn up and approved by the student, the proposed employer, the internship advisor and Division Chair. Internships require a minimum of 55 hours of on-the-job work for each hour of credit. Evaluation is made by the internship advisor in consultation with the employer. The course will help test the marketability of the new program, and we are looking forward to the interaction with employers of our students.

We are also allowing from the outset the possibility of independent study, in order to provide an opportunity to explore an area of study not included in the catalogue listing of approved courses. The topic of an Independent Study should be selected and carefully designed by the student and faculty sponsor, and must meet with the approval of the Division Chair. Normally, the student will be expected to have a cumulative grade point average of 3.0 and possess the appropriate background and interest to pursue the proposed area of study.

Finally, we are planning for a senior seminar in Information Technology, which will be a capstone course. Each member of the class will be expected in the first weeks to give a presentation to the group on what she/he has seen as the most interesting/valuable subject matter in Information Technology. The presentation will provide the groundwork for further independent investigation for that student for the rest of the semester. A proposal for this term-long investigation will be submitted and approved.

While students are working independently on these projects, the class as a group will investigate Information Technology in two areas: first, what are the hot topics in the field, which show the most potential for growth and impact in the coming years; and second, what are the coming social implications of IT? These investigations will take the form of readings, discussions, site visits, films, etc. The last few weeks of the semester will be given over to large-scale presentations by students of the investigations they have been doing all semester long. Hopefully this format will provide everyone with a next step in the field and an integration of the various subject matters in the program.

The program has certain features, which should be noted here:

1. The dominance of the set of core courses allows a tight control over subject matter for all students in the major; it is felt that this necessary, given that the major is multidisciplinary, and subject to wandering.

2. IT bridges the gap in existing majors that has been felt for some time. The convergence of computer science and communi- cations is not insignificant in our time. This program is a positive response to a quickly growing industry that provides exciting employment to creative, educated artists/communicators who have solid technical training.

3. The program can be introduced with little extra expenditure. Because it is built on existing, popular programs, it is a restructuring rather than a startup.

4. The major covers most of the bases for a respectable application to graduate school, without being impossible or impractical for others.

5. The minor provides an exposure to the different aspects of information technology, and should prove valuable as an applications area in other majors.

6. This program is based on a new concept of education in information technology; therefore, heavily researched comparison with programs at other schools is not possible. However, it is interesting that we are at the forefront here, leading rather than following.

It is important at this point in creating a new, forward- looking program that we reexamine the traditional ways that an academic program fits into a college. Because Information Technology influences virtually all aspects of the life of the institution, it is inappropriate to think of an IT program as simply constituting a major and a minor, particularly at a time of tight budgets and the resulting need to service widely on limited resources. We are trying not to think of the new program as simply a structure within which the only activity consists of students taking courses and faculty developing expertise in isolation from other activities.

It must be larger than that. We are at the moment looking into ways that the IT program connects to the ubiquitous needs for technology-based training and development throughout the college. There is also consciousness raising about technology that is necessary - and not just for students in the classroom - which includes awareness of new developments and creative use of their applications but also the societal implications of all of these developments. The old path of development seems therefore inappropriate to our new program.

---

* I wish to acknowledge the contributions of my colleagues, mainly Ray Oakes of Mass Communication and Richard Block of Graphic Communications, in the development of the program discussed here.

Process and Facilities as Critical Success Factors in Training and Supporting Faculty to Use Multimedia/Computer Technologies

Michael E. Kress, Ph.D., Professor
Special Assistant to the President for Information Technology, and
Chairperson, Department of Computer Sciences
Kress@postbox.csi.cuny.edu
718-982-2401

Arthur W. Hafner, Ph.D., Professor
Chief Librarian and Chairperson, Library Department
Hafner@postbox.csi.cuny.edu
718-982-4001

College of Staten Island
City University of New York
2800 Victory Boulevard
Staten Island, NY 10314

For questions concerning this manuscript:
Dr. Michael Kress
718-982-2401 (office) or 718-982-2404 (FAX)

Overview

The College of Staten Island recently relocated its facilities from two separate sites to a new, 204 acre campus. Through careful planning, we built a fiber optic infrastructure to provide campus-wide access to the computer network. The campus LAN connects approximately 2,400 computers and an integrated media information distribution system.

The integrated media information distribution system is state-of-the-art equipment that is located in the campus Library's Media Services Center. This facility serves as the hub for the distribution of digital information throughout the campus. The media distribution system allows faculty to integrate data, video, and voice transmission for presentation in more than forty-five classrooms and other specialty spaces such as conference rooms. Our system employs high speed transmission telephone lines to connect to a wide-area network with other City University of New York colleges that have similar systems and facilities to provide remote control and display of multimedia. This system also permits teleconferencing with limited two-way video, thus providing opportunities for participation in real-time inter-campus events. This connectivity allows the College of Staten Island to bridge as many as forty miles between the most distant CUNY college and itself in a way that is nearly transparent to the end-user.

We are now in our third year on the new Willowbrook campus. As we complete the installation phase of our project of establishing our computer network and installing computers in most faculty offices and teaching laboratories, the priority activities have become faculty training and curriculum development. These two important activities, despite the barrier of shoe-string

funding, enjoy a high likelihood of success on our campus. This is due, in large part, to the role and energy of members of the campus Pedagogy and Media Committee.

The Pedagogy and Media Committee

Over the past four years, the College of Staten Island Pedagogy and Media Committee has grown from a few interested faculty to a core-group of about thirty. The focus of the committee meetings has been programs around media/computer technology themes. Presentations have been made by campus librarians, Office of Information Technology technical staff, students from the Computer Science Club, and vendors who have displayed new equipment and technology at presentations. Meetings have also featured the work-in-progress of various faculty who are using multimedia/computer technology in a classroom setting.

Members of the Pedagogy and Media Committee have creatively coordinated campus-wide media-focused demonstrations and special events to promote faculty awareness and to create broader interest. They have sponsored hands-on workshops featuring elementary through advanced media technology applications. For example, during the 1995 Fall Semester, the committee sponsored a Media Fair that was structured around five popular themes. Between mid-October to mid-November, demonstrations and high-participation workshops were held each Thursday afternoon. These programs are important to mention because each reached-out to a different faculty or student group interest. The program workshops were:

1. "Ride the Information Superhighway," a demonstration and workshop session for persons unfamiliar with using a web browser such as Netscape. The session featured the campus's World Wide Web HomePage (http://www.csi.cuny.edu).

2. "There's No Place Like HomePage," explored students tutoring students to create an interactive syllabus using HTML as part of an English class. Participants also gained information about how they could go about creating a homepage for their classes and departments.

3. "Building Digital Books" was an enormously popular and successful workshop that was conducted by member of the college's Computer Science Club. The workshop featured HTML authoring and how to write for the World Wide Web.

4. "CSI's Electronic Library" explored the changing nature of libraries from print to digital form. Workshop participants explored databases that are on the Library's CD-ROM tower and also explored connection to other libraries through HYTELNET on the World Wide Web (http://moondog.usask.ca:80/hytelnet/).

5. "Computers in Teaching and Learning" featured an art professor's use of computers to find the hidden geometry in painting and also an education professor's use of interactive multimedia as an element of a lesson plan.

Reflecting over past years, the College of Staten Island faculty and staff pursued technology-in-the-classroom as a hobby or personal initiative. This situation was similar at other CUNY colleges. However, an accelerated change began toward acceptance of classroom media/computer

technology when the University initiated a training program, along with a small-grant program for courseware development. These initiatives enabled faculty throughout CUNY to obtain necessary training from experts. It also provided a modest amount of money for release time to allow faculty from all CUNY colleges to concentrate their individual interests to learn multimedia applications and to explore the pedagogic use of the new technology. Out of these efforts, a nucleus of faculty emerged who returned to their home campuses with new technology for classroom instruction.

College of Staten Island faculty who attended these programs and who were otherwise involved with the technology began to work with other faculty. Through their pioneering efforts, more faculty began to understand the importance of digital information and the potential for multimedia-based instruction.

Concurrently as faculty were beginning to develop interest and expand their proficiency in multimedia technology, various other catalytic events occurred on campus. Three of these were that computer laboratories came online for several academic departments, a few faculty began to use programs that they individually developed in their classroom instruction, and all faculty and staff gained access to electronic mail. At a later time, a large number of students were provided with e-mail access. These events brought our academic community closer to electronic-based technology.

The campus teaching laboratories in various academic departments quickly became a success. These disciplines were Computer Science (authoring, animation), the History Department (American History), the Mathematics Department (remedial mathematics through calculus), the Modern Language Department (French and Spanish), and others. The individually developed faculty programs were in areas such as astronomy, English composition, and sociology instruction, among others. Students and other persons with physical challenges were also included in multimedia activities. This occurred last year when a specialty center came online, The College of Staten Island Multimedia Regional Center for Deaf and Hard of Hearing Students. For our students with visual impairments, we introduced audio-tactile tablets and raised line drawings to provide graphical information. This technology is used at the college for a multi-sensory calculus course. Substantial grants from the National Science Foundation (HRD-9450166 and MUL-12345) and the New York State Graduate Research Initiative provided equipment for developing a multimedia laboratory for undergraduate instruction. In addition, a small New York State VATEA Grant provided funds for a project titled, "Learning to Learn Multisensory Adaptive Peripherals for Teaching Computer Skills in an Electronic Classroom."

The success of teaching laboratories, coupled with the interest, energy, and enthusiasm of faculty for multimedia technology, confirmed the belief of the college's senior administrators about the emerging importance and pedagogic value of multimedia technology. They also saw the potential impact of it for student retention and recruitment. Out of this realization, the college began to provide additional structure through staffing and financial budget support for equipment and supplies.

To support faculty who are using technology as part of their regular classroom pedagogy, the college administration provided funding and space for a Faculty Center for Excellence in Pedagogy and Media Technologies. This site, located within the Library, offers faculty access to a range of sophisticated software and equipment. To support the training needs of faculty, members of the

Pedagogy and Media Committee volunteered to work in academic partnership with colleagues who were interested in exploring media technology for classroom instruction. This program came to be known as faculty-to-faculty mentoring.

Impact of the Mentoring Program on Skill Development

At the beginning of the 1996 Spring Semester, faculty were invited to apply for six positions that were made available as part of the faculty-to-faculty mentoring program. This type of peer training began this past May with the opening of the Faculty Center for Excellence in Pedagogy and Media Technologies. The thrust of the mentoring program is to provide hands-on experience and training for College of Staten Island full-time faculty in a variety of media/computer applications.

For a faculty member to be selected to participate in the program, the person must evidence interest and must be familiar with word processing. The program features exposure to media/computer applications that underpin and enhance classroom instruction. Its purpose is to provide a standard for quality control and strategies for the effective implementation of these instructional technologies. These are activities such as creating digital presentation materials, incorporating multi-media formats into pedagogic methodologies, using e-mail for electronic office hours to increase faculty/student contact and student/student learning opportunities, and homepage authoring for the Internet-based World Wide Web. Faculty who are selected to participate in the program keep a log of their activities and are asked to make a presentation to the Pedagogy and Media Committee at the end of the semester. The faculty members' experiences and logs will be expected to serve as source documents for formal evaluation of the faculty members' skill enhancements, the instructional materials created, and the overall contribution of the Faculty Center.

Faculty who have used the Faculty Center for Excellence in Pedagogy and Media Technologies have successfully explored media/computer activities such as those mentioned earlier. They have also explored and some have successfully incorporated the Internet's World Wide Web as an information enhancement for classroom use.

Future Directions at the College of Staten Island

Preliminary evidence from our successful experience with the Pedagogy and Media Committee and the Faculty Center gives us reason to believe that faculty interest will remain strong for implementing educational technology in the classroom. This interest will most likely follow two paths. The first is that a small number of faculty will develop sufficient skills and expertise to create instructional programs that will become models. The second path will find faculty who use the Center to master basic media/computer skills, thereby preparing themselves to effectively incorporate commercially produced multimedia materials in their instructional presentations.

Concurrently, the college plans to develop a video conferencing capability that will provide real-time connectivity for video, audio, and data sharing to similarly equipped CUNY colleges and other facilities throughout the world. This technology will allow us to access and transmit locally available multimedia resources that would not otherwise be easily accessible. This capability will allows the College of Staten Island to move beyond the classroom without walls to a global model for the dynamic dissemination of instruction and information.

Project Vision: An On-line Learning Initiative for College Freshmen

Susan V. Monk
Department of Kinesiology
Penn State Berks
P.O. 7009, Tulpehocken Road
Reading, PA 19606
610-320-4882
E-mail: svm2@psu.edu

Web sites: Project Vision Health Education 48 Course
http://www.clat.psu.edu/homes/hlthed/hemain.htm
Center for Learning and Academic Technology Home Page
http://www.clat.psu.edu

Introduction

> "The Americans have need of the telephone--but we do not. We have plenty of messenger boys.?.?. "
> Chief engineer of the British Post Office upon hearing of the news of Alexander Graham Bell's invention. Clarke, A.C., How the World Was Won (New York, NY: Bantam Books, 1992)., p. 224.

This quote reminds us that there is always resistance to new technology, that it is never possible to comprehend fully what ultimately will develop from a new technology, and that it is difficult to envision what impact a new technology will have upon a society. One can readily see the parallels between the invention of the telephone and the rapid development of the information technology.

> "Higher education is being challenged to define new ways of creating and disseminating information..."
> Strategic Planning Report, Society for College and University Planning, Ann Arbor, MI, 1993.

Educators have always been concerned with finding better ways of teaching and learning, but there is increased societal scrutiny of the educational product, and demand of accountability for the qualitative nature of education. The development of information technology has received a mixed blessing from this scrutiny; where it has been welcomed, much time and effort is being put into its development, but the technology has also been assigned an enormous burden. It has been asked by some to fix all that is wrong with education and, indeed in some rhetoric, with society itself. We must acknowledge too, that there are those who find instructional technology

to be loathsome, signaling the beginning of the end of traditional quality. Instructional technology is neither a panacea for all of society's ills nor is it the destruction of the educational process.

Universities are exploring the potential of this new technology in a variety of ways, and the information which is gleaned from these innovative uses of technology will do much to provide a more reasoned approach to its use.

Project Vision has been undertaken by the Penn State University Commonwealth Campus System. The Commonwealth Education System includes 18 different campuses across Pennsylvania with over 850 faculty at the various locations. In the initial phase of the project, three campuses were chosen, each of which selected three faculty and twenty students to participate. In addition, a librarian from each of the three campuses also took part.

Each campus selected twenty incoming freshman based on an application submitted by the student, including two essay questions and requested references. Every attempt was made to obtain a representative cross-section of students. Early in the project, a variety of assessment instruments were administered to Project Vision (PV) students and to a random sample of non-PV students at each of the campuses. The PV students were found to be similar to other students on a variety of motivational and learning style parameters.

Teams of faculty, one from each of the three campuses, were responsible for developing on-line courses in their respective disciplines. Three courses were selected for the first year: Health Education (1 credit), American Studies (3 credits), and Science and Technology in Society (3 credits). These particular courses were selected for the project because they were General Education courses and have a flexible course structure. In addition, a new course was developed, Library Studies (3 credits), Learning Strategies for the Information Age, to introduce the students to the technology and search skills necessary to use the computer effectively as a means of information identification and retrieval.

Designing the on-line educational environment

When developing and teaching an on-line course the instructor has to develop an understanding of the nature of the medium, so that the structuring of the learning environment is appropriate for the learning activity. In Health Education, a conferencing software called First Class, which enabled the construction of on-line conferences wherein students could carry on asynchronous postings and discussions, was used. The instructor, in effect, has to design not only the "classroom", but social spaces and informal spaces as well. The key is to design an environment in which there is both a sense of group and community and an evident structure. This requires extensive planning and consideration of factors not normally associated with the teaching process.

The nature of on-line courses is that they can be very dynamic and fluid; content changes throughout the duration of the course. New material is available everyday and things can be added or deleted from a course as it is on-going.

Access to technology

A critical factor for the success of on-line courses is the availability of technology to the student and the instructor. This has two major components: reliable consistent access to the learning area and the appropriate tools, and, secondly, sufficient technological skills for the student and teacher. Both of these factors must be considered when designing an on-line course and the limitations weighed accordingly.

In Project Vision, the first factor was, in large part, addressed by giving the participating students the use of their own laptop computer for the school year and either a direct connection from their dorm room or the capability to dial-in from home. Even under the best of circumstances, technology being what it is, many frustrations occurred with the learning process when there were problems in connection due to individual or system failures. All students had the same machine and identical requisite software. As the incidence of on-line course offerings increases, the demands on existing institutional systems will increase commensurately, and the issue that arises for college students and their families is, how disadvantaged is a student who does not own his or her own computer? There are recurrent discussions at Penn State, and I am certain at other institutions, about the desirability of requiring all students to have a computer as a condition of enrollment. The instructor who is designing an on-line course has to take into account what student access is going to be, whether the public labs can handle the demand, or, if the assumption is made that students have their own computers available, what is the lowest common denominator for the state of technology and software capabilities on student-owned machines.

The individual level of technological knowledge for students and instructors is another factor that has to be addressed. At this point in time, generally basic technological training has to accompany the course content, and further, it appears that at most institutions the course instructor will have to teach the technologies. This will change as students get more technological training in the secondary schools, more faculty are trained and use the technology, and specialists are hired for course design and support through institutional promotion of learning technologies. My observation at this point is that our assumption that the secondary students are coming to college with sufficient computer skills is an erroneous one. We asked our PV students about their level of expertise on the computer, and even those who rated themselves as having a high level of proficiency were in need of training in the skills necessary to use the computers skillfully in the learning process. In Project Vision, we accomplished the needed training primarily through the Library Studies course, Learning Strategies for the Information Age, as part of the PV curriculum for the first semester. Students were taught the use of e-mail and chat programs, Netscape browser, library search skills, Gopher, Veronica, Archie, conferencing software (First Class), and presentation software (Persuasion). This course also taught methods of citing sources, information retrieval skills, copyright awareness, and other

associated topics. Institutions will have to decide what constitutes a minimum level of computer competency for a student, how it will be taught, and how to encourage and support the application of the skills throughout the curriculum of the institution by the faculty.

Faculty training and support is very time intensive and expensive, as is the equipment needed. It is not necessarily the case that the instructor must develop a high level of technology "know how", especially if there is technical and design support available, but one has to have a modicum of understanding of the capabilities and limitations of the technologies to develop on-line materials and to be ultimately creative with the potential use of technology in the classroom. Institutional support is a must, not only in giving the faculty time and training, but also in acknowledging the faculty time and skills necessary to use the technology for teaching and learning through the reward system. Unfortunately, this is not the case at all universities, particularly those which have defined themselves as research institutions.

Socialization

The issue of how on-line course work impacts on the social development of college students, particularly freshmen, is an important one, and one which has not been studied because the experience is new. This issue takes on increasing importance as the relative proportion of a student load becomes on-line, and as students participate from locations other than the campus. In Project Vision, our students took only four credits of their first semester and six credits of their second semester on-line; otherwise they were enrolled in classroom courses. The Library Studies course had many face-to-face meetings in the early portion of the Fall semester. As a greater portion of a student credit load consists of on-line courses, the consequences in terms of social factors will assume greater importance. It may be that for the traditional undergraduate, it is better to have courses which provide both an on-line component and face-to-face interactions.

The social development of the on-line experience is an important one, particularly if students are located remotely from the campus. We tried to build a sense of community across the three campuses by having a picnic at the beginning of the year. To instill a sense of local community among the students on a particular campus, we established "learning studios" at each of the campuses, a work area which was reserved for students enrolled in Project Vision. This was an attempt to give them a space to which they could "connect" with other students and have a sense of belonging to a group. Interestingly, at the two campuses that had dormitories, this area was rarely used by the dorm students. At the third campus, whose population is entirely commuter students, this area became extremely popular and a campus focal point for all the PV students. These students have voiced many objections to losing their space for next year when it is to be used for the new freshmen Project Vision students.

Health Education Course

As mentioned previously, the courses which were initially selected were courses that had fairly flexible content and such is the case with the Health Education course. The topic of Values and

Health Behaviors was selected, with a focus on bio-ethical issues relating to reproduction. The course components included specific content area, group presentations, and on-line discussions of the group presentations. The specific content included material that related to the anatomy and physiology of the reproductive system, material that the developers felt was necessary background material, enabling students to understand concepts of anatomy and physiology they might encounter in their readings and research. This material was very structured and was available to the student on a Web site they could readily access and study. Students were also given an assignment to go to a specified site in Australia to read a posted document about bio-ethics. These early assignments were designed to make students comfortable with accessing and reading materials on the Web, as well as providing good introductions to course issues.

It is important to note at this point that the Library Studies course, which was teaching the skills needed to allow students to do meaningful and productive research on the Web and in the library, had the students do assignments utilizing content areas that would be relevant for their Health Education assignments, thus giving them immediate relevance for the skills they were learning. This enabled students to have a focus on content and apply the skills they were learning appropriately; this was both a motivation and a time saver, since the Health Education course is only a one credit course and otherwise the workload may have exceeded what should be expected for a one credit course.

Group presentations and the ensuing discussion of those presentations made up the major portion of the course . Groups were assigned and they chose the particular issue they wanted to research and present. Group presentations were to include a slide presentation and textual material which other students could read and to which they could respond. As could be expected, there were many problems associated with the group processes, not unlike the problems often seen in group work. The use of technology did nothing to change that; in fact, students did not utilize the available methods to meet and discuss on-line, the majority preferring to use face-to-face discussions. Some examples of student comments* about the group process were:

> "Our group works once we get together, but there hasn't been one meeting that every member has attended except during classtime. It is EXTREMELY frustrating. Some of us feel like we're doing it all."

> "As for the group work, I generally dislike it, because I like to do things in my own way and I like to just get things over with as quickly as possible and not drag them out."

However, there were successes in the group processes. Students learned about group work, projects were collaborative, individual responsibility and responsibility to the group goal was developed, and there was more ownership of work.

* All of the student comments in this paper are taken from a conference in First Class called "How's it going?", a conference in which students were to post any comments they chose to make throughout the semester about the project. The quotes are taken directly from the conference postings and are presented as written by the students.

"I think that this has been a really good experience for me. Not only to learn about computers, but about people as well."

"But I know that in group situations compromise and communication are VERY important."

"I guess I think working in groups prepares us for the future and having to work with people who have different work ethics and even people who have none."

"As for me I know that I would much rather be put in this type of situation in school, where I can learn how to deal with these types of problems, rather than be faced with them for the first time in a professional setting and possibly not know how to deal with it."

After the groups posted their presentations, students had one week to read and discuss the presented issue in the on-line conferences. The group that posted the presentation was responsible for monitoring the discussion during that week. The quality of the on-line discussion was not good, and that is one of the factors we hope to improve for the next session. Responses, predictably, were often opinion and not referenced, with few logical threads. The role of the instructor in on-line discussions is an interesting question of balance between feeling one is contributing either too much or too little. If the group has been given the responsibility for monitoring the discussion, there is a fear of too much interference by the instructor in the discussions. When mis-information or excessive "bickering" occurs, it is not clear how long one should wait before stepping in. The instructor wants to give the appearance of being actively engaged in the discussion and yet not give the students the sense that he or she is "watching over" the conferences.

Grading

Grading an on-line course presents an interesting challenge to examine and perhaps redefine what should be evaluated and how. How one evaluates relative contributions of individuals to group projects and asynchronous discussions is not clear, nor is it satisfactory to many students. In the Health Education course we had the students in a group divide 100 points among the other members of the group, based on their perception of the contribution of that individual to the group. Students liked being able to differentiate and reward the doers from the slackers, but still wanted credit for what they had done specifically, e.g., putting their name on the portion of the project they completed. Students who do the work are inherently uncomfortable with another student receiving credit for the group project when he or she has contributed little or nothing, and rightfully so. These problems of grading group work certainly are not specific to on-line projects, but it may be that on-line courses may present some solutions that may not be possible otherwise.

To assess an individual student's other accomplishments in the course, each student was asked to assemble a portfolio of the resources they had found and their contributions to the group

discussions. In essence, they were asked to make their own case for the quality of their experiences and contributions to the course.

As long as we, as faculty, are responsible for assigning a grade at the conclusion of a course, this is an area that requires much thought, discussion, and planning. Grading has to be an inherent part of the course design, so that the instructor and the student have a thorough understanding of what a good grade, versus a poor grade, represents. Those of us who have traditionally based our grading on a quantifiable, knowledge-base acquisition have to rethink what should be evaluated when group work and interactive learning are a major portion of the course objective.

Student reaction to the Project Vision experience

Since we are just ending the first year of this project, we have few answers and insights for the question, what are the characteristics of the students who gain the most, or, conversely, the least, from this type of learning experience? It is my sense that the learning of the technology benefited the majority of students positively in terms of their performances in their other classes, and this idea was reinforced by student feedback. For example, one student who is an Education major did a required presentation in an educational theory course by using her computer and presentation software based on material she had researched on-line. While this is desirable, it raises the issue once again about the possible inequities which may result between students who have private access to computers and the skills to use them effectively, and those who do not. Institutions and faculty have to do what they can to ensure that a situation does not develop in which there is an inherent unfairness for the population of students who do not have the means to own or use a computer. A certain inequity will exist during this transition time, but institutions must plan and budget for the means to avoid any systematic unfairness. The improved skills in information retrieval and presentation, as well as the exceptional access they had to these sources, will benefit all students.

In general, the students were very positive about their experiences. The part they liked the least was the group work. One student comment sums up the feelings of a number of students:

> "Project Vision has taught us a great deal and I am thankful for being a part of this program. But I thought this was to be focused on learning how to use the computers and not working with others. "

It should be pointed out that it was made clear in the brochure and in the initial meetings with the students that working with others was to be a feature of this project.

Other student comments that are of interest:

> "Faculty members: Do you realize how hard it will be for us to part with this? We're used to having these computers EVERY singles day? I don't know what I'd do without it."

It's not just the computers we're talking about. It's the whole concept behind project vision. If we leave it after this year we will have gained a lot of knowledge, but if we keep going; think of the possibilities. We really have become a family, and we don't want this to end here! "

" Project Vision taught me more than just about the information I recived from the classes, but I learned how to work in groups with other people from all different backgrounds and ideas and I learned how many increadible and unlimited things that are possible with technology. "

"I was computer illiterate, but I didn't want to remain that way. Project Vision is not only learning the awesome technology and preparing for the future, it's also a great way to meet guys. [Just Kidding :)] "

"Working together, I think, made us become closer. It's like we have our own little nitch on the campus. We hang out in our learning studio, go to the mall, and are now beginning to plan trips together. It has been a great experience and I wouldn't give it up for anything. "

"Anyway , PV has been a great learning experience for all of us. It has given us access to information that I never knew existed. I will definitely miss not having all of this information at my fingertips."

Implications

Having been involved in the use of technology in education for about a year and a half, I have some observations.

The use of technology in the classroom will increase dramatically over the next 3-4 years, as will the use of technology for course-related functions outside the classroom. Students who do not possess computer skills are at a disadvantage, and so, too, are students who are unable to own a computer.

The potential benefits of the widespread use of technology will be limited by the inability of the institutions to provide hardware and software access to all students. This may seem obvious, but it is important that institutions and course developers recognize this fact.

In the short term, use of instructional technology will be expensive and inefficient, but this will change in the long run.

In carefully designed instructional environments, there will be opportunity for students to learn in a manner best suited for the individual.

Students will have better access to information without time or location restraints; however, we have to ensure that the educational value is as good as, or better than, that which can be realized without the technology. Just doing something because we can is not wise unless it demonstrates its value in the learning process.

Faculty innovation and redesign of courses will enhance the educational experience because it is always good to reexamine what we do, even if we decide that which we have done is best.

Not only will individual courses be redesigned, curriculum redesign will occur, but not in the short term.

Student preparedness and their capacity and inclination to use vast resources is overestimated. Technology in and of itself will not automatically transform students into active and involved learners, avidly seeking information.

There are many ways to use technology to enhance the learning process and no one way is inherently superior. Bad teaching will not be improved, but good teaching can become better with thoughtful application of the tools that are available.

What is next?

The same four courses will be repeated by the three original campuses with an additional three, bringing the total to six campuses and 120 new Project Vision students. The courses will be revised and improvements made. The current PV students will have Speech Communications and English Composition as second year courses.

In addition, there is a second project called Project Empower in which faculty are being supported to develop portions of their existing courses to use the technologies for interactive and collaborative work. In the first phase, which is underway now, 104 faculty from the Commonwealth Education System have projects underway for implementation in Fall, 1996. In one of the projects, a group of incoming freshmen will be part of a "freshman experience" in which the student will take Health Education, Psychology, English Composition, and Integrative Arts and Earth and Mineral Sciences courses, all of which will have a portion of the course work on-line. The student will have one additional course, probably in Math, which will not be on-line. Thus, nearly the entire course load for a first semester freshman will have significant on-line components included.

There will be a new round of Empower proposals called for in the Fall, and again in the Spring. The stated goal of the Commonwealth Education System is to have 80% of the faculty using technology in some form by Fall, 1997. Institutional support for approved proposals includes a laptop computer, training and instructional support, and minimal release time.

Conclusions

What Project Vision has demonstrated in the first year is that it is possible to offer courses which are taught on-line to freshmen students and have the students be successful and enjoy the experience. What is less clear at this point is how the different learning environment enhanced or detracted from what the student experience as a freshman may have otherwise been. Another question, which is being addressed, is whether the experience does actually alter the learning styles of students and whether the change is desirable.

The extent to which an experience such as Project Vision will improve the educational experience of our students and help them to become life-time active learners remains to be seen. However, quotes from two students suggest that, at least for some, we are on the right track.

> "This was by far the best education experience I ever had. "
>
> "I Thank every one involved with Project Vision ... you have made a great difference in my life."

DISTANCE LEARNING AND TODAY'S EDUCATIONAL ENVIRONMENT

Dr. Thomas A. Pollack
A.J. Palumbo School of Business Administration
Duquesne University
Pittsburgh, PA 15282
412-396-1639
pollack@duq2.cc.duq.edu

ABSTRACT

The large pool of part-time non-traditional students along with the increasingly popular notion that the student is a customer who must be served provides an impetus for distance education/learning initiatives. Technology will have a significant impact on the way colleges and universities deliver their educational products now and in the future. Although still relatively expensive, distance learning equipment can be cost-justified by the competitive advantage it provides.

This paper will describe a distance education/learning project being undertaken at Duquesne University using technology manufactured by VTEL. Both equipment configuration and program initiatives will be discussed.

INTRODUCTION TO DISTANCE LEARNING

For purposes of this paper, the terms distance learning and distance education will be used interchangeably. In a general sense, distance education is any form of teaching and learning in which the teacher and learner are not in the same place at the same time, with information technology their likely connector (Gilbert, 1995). Distance education is the process of extending learning or delivering instructional resource-sharing opportunities to locations away from a classroom, building, or site to another classroom, building, or site by using video, audio, computer, multimedia communications, or some combination of these with other traditional delivery methods (Gross, Muscarella, and Pirkl, 1994). This paper is concerned primarily with interactive distance learning, the type that connects people with other people via technology. It means getting people and video images of people into the same space so they can help one another learn something. It is a system that connects learners with distributed resources (Filipczak, 1995).

Distance education has become the new focus of college and university presidents, largely the result of a maturing and diverse college populace. Budget constraints, the dwindling pool of traditional students, increased competition from rival institutions along with significant cost-effective advances in technology have resulted in many new and creative distance education initiatives. Improved

technology allows for the transmission of signals over terrestrial lines called ISDN (Integrated Services Digital Network) lines that produce reasonably good picture quality. This has made distance learning possible for many educational institutions. ISDN lines carry much more information than regular phone lines but not as much as fiber optic cables. With ISDN lines, the video gets compressed before it goes through the cables, causing a slight delay between delivery and reception. Rapid movements produce "jerky" picture transmission. When fiber optic cables become available, most video-conferencing will upgrade to that medium (Filipczak, 1995). In years past, expensive satellite transmission charges made the cost of delivery for distance learning prohibitive for most colleges and universities and many businesses.

WHY DISTANCE EDUCATION?

In a live video-conference presentation at the April 1996 Quality Forum held in Pittsburgh and co-hosted by Duquesne University, Carnegie-Mellon University, and the University of Pittsburgh, the father of modern management, Peter Drucker, predicted that in the next ten years, more college students will study off-campus than on-campus. An examination of recent statistics published by the U.S. National Center for Education Statistics (1991) indicates that in excess of 57 million adults are enrolled in part-time educational activity, and a mere 13 percent are in pursuit of a degree. We are in a period in our history that emphasizes life-long learning for various reasons, and statistics support this. Of the 57 million people mentioned above, 30 percent are involved in education for personal reasons, and 60 percent are involved in an effort to advance on the job. This very large population of what we have historically referred to as non-traditional students must be serviced. This group of students will be older, probably over 26, and most will work. They will require flexible learning schedules (Gross et. al., 1994). Older students have begun to outnumber traditional age students, and as a result of todayÆs business climate, they may need to renew their educational skills several times during their careers. If your institution does not wish to extend its campus to service the non-traditional market, perhaps your cross-town rival will, and this may constitute a competitive threat. Many institutions of higher education consciously seek opportunities to expand their pool of students while at the same time servicing their community. In any event, non-traditional educational delivery systems, such as distance learning, seem to have an appeal to the non-traditional pool of students. Distance learning is just one of many educational delivery models to consider. There are some who feel that public institutions will have to develop an array of distance education courses to complement on-campus courses in order to remain affordable. At this point in time, The Open University in the United Kingdom is the premier distance teaching institution in the world.

Higher education is currently facing three major challenges. First, to provide high quality instruction adapted to the twenty-first century; second, to supply education to every young student and adult who requires it; and third, to deliver programs as cost-effectively as possible (Duquet, 1995). The entire landscape of higher education is undergoing changes. Competition for students is more intense than ever. At the 1996 meeting of the American Assembly of Collegiate Schools of Business (AACSB) held in Los Angeles from April 21-23, it was reported that "corporate university" programs now number approximately 400, and at least 30 percent are now seeking educational accreditation from the very same accrediting agencies with whom we are associated. Among the leaders in this group are Motorola University and the Arthur D. Little School of Management. These "corporate universities" pose a competitive threat to long-established programs in higher education, and in particular, graduate programs. In the United States, we are faced with the prospect of retraining 50

million workers, and corporate America is using distance learning for all aspects of internal and external training. Because of technology, geographic barriers no longer exist; a competing college or university from across the country can deliver a "best in class" educational program which attracts your students in your own "backyard" via technology.

TEACHING AND LEARNING PRACTICES

Peraya (1996) in a position paper on the WWW and Rogers (1995) reinforce a prevailing notion in today's educational community, namely that over the last 15 to 20 years, educators have been influenced by the social and cognitive sciences to the extent that our educational system is now focused on learning rather than teaching. Learning is defined as students' guided efforts to construct knowledge for themselves, in addition to merely receiving information from an instructor and other resources (Rogers, 1995). Learning is independent of time and place. Knowledge is "socially constructed though action, communication, and reflection involving learners." Teachers may gradually become advisors, managers, and facilitators of learning rather than providers of information (Peraya, 1996).

The straight lecture method of instruction is a thing of the past! Studies have proven that attention spans for even the most attentive students do not exceed 15 to 20 minutes. To make distance learning, or any kind of learning, more effective, the instructor must actively involve learners in the learning process; give them something to do besides listen to the professor talking (Filipczak 1995, Robinson, Rogers 1995 and Ward 1995). Faculty training is critical for distance learning success. It is a fatal error to assume that one should simply replicate regular classroom instruction, but on camera, for effective distance learning. The professor must not only develop quality instructional materials and activities, but also must be mindful of the use of technology. Insightful attention to pedagogy is an essential aspect of all types of instructional design, but it is particularly important when one's presentation is being captured on camera. Rogers (1995) contends that distance learning has the potential to meet new educational demands because it can provide instructionally effective, highly interactive learning experiences that are flexible, equitable and responsive to individual needs. This will not happen accidentally; it must be skillfully planned. The instructor must maintain faculty to student interaction via conversation, Email, class meetings, and visits to remote sites in order to achieve success and to distinguish distance learning from self-instruction programs. Purposeful learning occurs when individuals recognize a gap between where they are and where they want to be and draw upon available resources in order to close the gap. It has also been determined that group learning, insofar as it creates a learning atmosphere of mutual support, may actually be more effective than individual learning (Robinson). Distance education naturally lends itself to the formation of groups, particularly at remote sites.

The list of recommendations for the distance learning instructor is too lengthy to enumerate in this paper. The major points will be summarized, shared, and discussed when this paper is presented.

DISTANCE LEARNING AT DUQUESNE UNIVERSITY

Duquesne University decided to invest in distance learning technology early in 1995. The University's Division of Continuing Education was asked to develop distance learning/education initiatives for the University, and a very capable member of that division was assigned the

responsibility of coordination. A series of excellent training sessions for administrators and faculty have been conducted over the past academic year in an effort to generate understanding, interest and enthusiasm. The technology platform chosen was VTEL, and the equipment was delivered and installed late in the summer of 1995. The initial installation was made in a large conference room in the School of Business, but plans currently call for the equipment to be moved to a smaller dedicated classroom in the University's new technology-rich Bayer Learning Center. A number of large VTEL installations exist across the country. Two of the more notable and established VTEL initiatives include the systems of the state of Oregon and Oklahoma State University. Oklahoma State University has been successful in implementing a rather extensive distance learning program. The state of Pennsylvania has also embarked on a statewide initiative for distance education called the Center for Agile Pennsylvania Education (CAPE) consisting of community colleges, colleges and universities across the state. Duquesne University has joined this state-wide consortium in which members are encouraged to provide courses in areas of strength for sharing and exchange.

The cost of the VTEL system installed at Duquesne University was approximately $91,000. Major equipment items purchased include two cameras, one an instructor's camera with tracking capabilities, a document camera-overhead projector unit, sound equipment, three 27 inch video monitors, a 486DX microcomputer with distance education software, a network connection subsystem, and ISDN lines. Cost of transmission is approximately $42 per hour if connecting with another MCI customer. If connectivity involves switching to another long distance carrier, the cost of transmission escalates to approximately $82 per hour. Other associated costs typically are incurred for rental of the remote site(s), between $30 and $100 per hour of connect time. Multi-site programs require that each site dial into a commercial telephone bridge called a multi-point conference unit (MCU), and each site pays an additional dollar per minute. The CAPE Consortium of which Duquesne University is a member, has purchased its own MCU, and plans to have it operational by the fall of 1996 at which time the dollar per minute charge will no longer be assessed. Although the VTEL technology allows for connectivity to non-VTEL equipment such as PICTURE-TEL, some degradation does occur in transmission as a result of transmission protocol. We have been successful in connecting and transmitting to non-VTEL sites. This technology incompatibility is not at all unlike incompatibilities we have encountered with other technologies in the past when they were in their infancy. The incompatibility problems can be overcome with a little extra effort.

What has made distance education economically feasible is the fact that full motion video can now be transmitted with reasonably good quality over ISDN telephone lines. Frames are lost in broadcast transmission, and as a result some movements, particularly those that are rapid, make the actors appear slightly robotic. There is also a very slight delay in sound. This frame loss and sound delay can be overcome by using satellite transmission, but the hourly cost of satellite transmission is prohibitive for most educational institutions and really not necessary. Transmission via ISDN lines is adequate for most educational presentations, and it is not annoying to watch a broadcast after an initial adjustment. In the future, we will transition to the use of fiber optic cables for delivery.

Duquesne University has made a significant monetary expenditure for distance learning equipment and training. Each school within the University has been asked to identify areas and locations which can be targeted as distance education possibilities. The position taken by the School of Business at this time is that we are willing to deliver any of our courses via distance learning, if we can find

partners and if the faculty member is a willing participant. We have had preliminary discussions about providing financial incentives for faculty who deliver courses or programs in a distance education format. Satisfying an educational need in an area or locating a complementary partner are perhaps the most difficult aspects of becoming established in the delivery of distance education programs. Efforts in these areas are time-consuming and involve a great deal of research and planning.

The School of Business is discussing the possibility of delivering an MBA program to a group in Nicaragua, in part, through distance education and in part via face-to-face instruction. This is very much in keeping with conclusions drawn by Duquet (1995). There are demands for education and continuing education in many under-developed countries, but "face-to-face teaching provided by conventional institutions is too costly and does not cater to the diversity and specificity of demand. Distance learning in conjunction with face-to-face teaching seems to be the only alternative for the years ahead." Obvious advantages to delivery of programs via distance education are convenience to both school and student and tremendous cost savings on travel and lodging.

It is estimated that there are approximately 300,000 students taking for-credit courses at a distance. Cited as advantages are minimal or non-existent residence requirements, coursework that can be scheduled around work and family, quality of instruction on a par with resident degree programs, and comparable costs (Chadwick, 1995). Bob Filipczak, editor of Training Magazine writes (1995) that much of the research about distance learning over the last 50 years has shown that there is no significant difference in the effectiveness of distance learning compared with face-to-face instruction. This may be good news or bad news depending on how one looks at this issue. The primary disadvantage is the lack of personal contact.

Our School of Pharmacy recently delivered a series of continuing education credits to a group of pharmacists in Northwestern Pennsylvania. This arrangement worked well because there is not a pharmacy school located in that part of the state. Our chemistry department has partnered with several schools in the midwest, and the result is that chemistry courses originating at Duquesne are being video-conferenced to the midwestern US. We are negotiating with several other sites to deliver educational programs, but our distance learning initiative at this point is still in its infancy.

The concept of distance education, as one might readily surmise, is not without its critics. As reported in the Chronicle of Higher Education (1996), the American Federation of Teachers has issued a position paper that essentially opines that the shared human space of a campus is essential to an undergraduate education and cannot be compromised too greatly without rendering the education unacceptable. The paper also declares that graduate programs taught entirely through distance education also are "problematic." The paper emphasizes that questions raised grow out of concern for educational quality, not job security. "Better education, not cost-cutting, has to be the first principle," the paper concludes.

CONCLUSION

There is widespread agreement that institutions of higher education are in the midst of a paradigm shift. We are faced with a shrinking pool of traditional students, and as the concept of continuous lifelong learning becomes a reality, we are faced with an ever-increasing pool of non-traditional

students that we must service as customers. Competition among institutions of higher learning for these non-traditional customers is keen. These customers, however, have jobs and responsibilities which cause them to seek non-traditional delivery of educational programs. One such vehicle for instructional delivery, once frowned upon by the educational elite, is distance learning. Distance learning has the potential to provide many students with the most viable means of improving their skills, and distance learning should continue to grow as committing to classroom time is difficult for the adult learner. We now have the technology to deliver reasonably good quality broadcasts for distance learning. It is our responsibility as educators to develop and deliver educational products that produce results through distance learning that meet or exceed our expectations.

REFERENCES

Blumenstyk, Goldie. (1996). Faculty Group Calls for Caution and Curbs on Distance Education. The Chronicle of Higher Education. January 26.

Brown, Dave. (1996). Teleconferencing Bytes, Camera, Action! Network Computing. March 46-55.

Chadwick, John. (1995). How Learning is Aided by Technology. Link-Up. March/April 30-31.

Coombs, Norman (1995). Giving Distance Learning A Try. American Association for Higher Education Bulletin. December 11-12.

Filipczak, Bob. (1995) Putting the Learning Into Distance Learning. Training Magazine. October 111-118.

Gilbert, Steven. (1995) Why Distance Education? American Association for Higher Education Bulletin. December 3.

Gross, R., Muscarella, D. and Pirkl, R. (1994). New Connections: A College Presidents Guide To Distance Education. September 4-63.

Morehouse, D., Stockdill, S. (1992). Critical Factors in the Successful Adoption of Technology: A Checklist Based on TDC Findings. Educational Technology. January 57-58.

Moskowitz, Robert. (1995). Distance Education: A Look At Courses and Curriculums Offered On-Line. Link-Up. November-December 38-40.

Peraya, Daniel. (1996) "Distance Education and the World Wide Web (WWW)." Position paper published on the WWW, University of Geneva.

Raffaele, Elizabeth. (1996). Area Universities Tested as Students Look for High Tech Global Campuses. Education & Training Quarterly. March 17.

Raschke, Carl. (1995). Strange Days For Education. American Association For The Advancement of Core Curriculum. December 2-4.

Riley, Richard. (1995-96). Connection Classrooms, Computers, and Communities. Issues In Science and Technology. Winter 49-52.

Robinson, Russell. Adult Living: A Matter of Change. An Introduction to Helping Adults Learn and Change. Omnibook Co.

Rogers, Susan. (1995). Distance Education: The Options Follow Mission. American Association For Higher Education. December.

U.S. National Center for Education Statistics. Adult Education Profile for 1990-91.

Ward, Edna C. , Lee, Edward J. (1995). An InstructorÆs Guide to Distance Learning. Training and Development. November 40-44.

The Computerized "Assistant Prof"

J. Stuart Shough
School of Business and Economics
University of South Carolina at Spartanburg
800 University Way
Spartanburg, SC 29303
864-503-5589
SHOUGH@worldnet.att.net

Introduction

This program is written in Lotus 1-2-3 to aid college professors in all their various administrative duties. This program performs four (4) distinctive functions: 1) record keeping, 2) form producing 3) grade calculating, and 4) feedback of student class standing as well as complex grade calculations and what-if analysis because of its integrative nature and its extensive network of macros. By using this program a professor can save time on the traditionally tedious while providing information that serves both interests of the students and the college.

Record Keeping, Form Producing, and Grade Calculations

This part of the program is used to maintain the students' names, identification, class attendance, class participation, homework performance, grades on writing assignments, points for extra credit, and grades on quizzes, tests, and exams.

Macros are selected from drop-down menus to allow the professor to enter information. In order to set up a new class, the professor selects a macro that allows entry of the student names and an assigned student ID number. When recording test grades, a macro requests the student ID and the student's test grade. With the input of this information the macro places the test grade in the proper cell in the "Grades" worksheet. There are formulas in this worksheet to average student grades and formulas to determine letter grades--see Figure 1. Grades for chapter quizzes may be recorded in the same way.

Manual input, meaning that macros from drop-down menus are not used, is required for attendance, class participation, homework, writing assignments and extra credit. At the beginning of the semester student names and ID's are entered in the "Grades" worksheet. Another worksheet, "Labels," contains formulas that place student names into a 3 column by 10 row matrix that allows printing thirty (30) student labels per sheet of labels for file folders. The file folders are used by the students to turn in their chapter homework assignments, writing assignments, and extra credit. The forms for recording homework grades and extra credit points have an added benefit because they are taped inside the students' individual folders and serve as visual reminders of the quality and quantity of one's every day performance every time students turn in homework. Only points DEDUCTED are placed on the form for chapter homework and writing assignments. Points RECEIVED are listed for extra credit. The file folders remain in the custody of the professor and are manually posted to

the program before each test--see Figure 2. Attendance sheets are printed at the beginning of the semester for taking attendance and points DEDUCTED are manually entered in the program before each test.

Attendance, class participation, chapter quizzes, chapter homework, and writing assignments equal one test called Test IV. The program contains formulas that drop the students' lowest quiz score. Test IV has equal weight with all other tests. Points deducted for these items are subtracted from one hundred, thus allowing the student to know their Test IV score at all times, see Figure 3. Extra credit points earned are added to tests during the semester.

Student Feedback Component

Probably the most appreciated aspect of the program is the student feedback component. Macros create a bar chart, line graph, and a pie chart after each test. These are printed out on a single sheet of paper, see Figure 4. These graphs are given to every student in order to provide a visual aid of individual as well as class performance.

The program can also perform what-if analysis for each student. Based on a student's performance to date, the program can provide the scores that one must attain to reach a desired letter grade in the course, see Figure 5. Due to the right to Privacy laws, we no longer post final grades for the students at the University of South Carolina at Spartanburg. With the assignment of a secret two-digit identification number for each student, professors can provide grade information. The what-if analysis is greatly appreciated by the students since it shows them their class standing as well as their peers.

Figure 1

COURSE NAME	***INTERMEDIATE ACCOUNTING***		
COURSE NUMBER	**SBAD 332**		
COURSE SECTION	**001**	**CLASS HOURS**	**11:00am - 11:50am**
SEMESTER	**SPRING 1996**	**CLASS DAYS**	**M - W - F**

NAME	I.D.	TEST I	TEST II	TEST III	TEST IV	TOTAL	AVG	GRADES
PASSING STUDENT	PASS	60	60			120	60.0	D
	37	45	50			95	47.5	F
	17	95	96			191	95.5	A
	13	81	80			161	80.5	B
	94	65	44			109	54.5	F
	25	68	76			144	72.0	C
	1	58	50			108	54.0	F
	88	55	48			103	51.5	F
	97	58	60			118	59.0	F
	2	68	68			136	68.0	D+
	60	68	44			112	56.0	F
	5	71	42			113	56.5	F
	31	71	44			115	57.5	F
	23	85	76			161	80.5	B
	39	75	62			137	68.5	D+
	40	71	64			135	67.5	D+

Figure 2

INTERMEDIATE ACCOUNTING
SBAD 332
SPRING 1996

CHAPTER	TEXTBOOK HOMEWORK	COMPUTER HOMEWORK	COMPUTATIONS & FORMS	APPEARANCE & ORDERLY	TOTAL REDUCTION	EXTRA-CREDIT POINTS
14						
15						
16						
17						
18						
19						
20						
21						
22						
24						
WRIT. #1						
WRIT. #2						

Figure 3

COURSE NAME **INTERMEDIATE ACCOUNTING**
COURSE NUMBER SBAD 332 — TEST IV TOTALS
COURSE SECTION 001 — CLASS HOURS 11:00am - 11:50am
SEMESTER SPRING 1996 — CLASS DAYS M - W - F

NAME	I.D.	QUIZZES	H/W	ATTEND	PART	WRIT I	WRIT II	TOTAL
	2	1	0	0	0	0	0	99
	25	1	1	0	0	0	0	98
	97	1	1	0	0	0	0	98
	17	2	0	0	0	0	0	98
	31	2	0	0	0	0	0	98
	58	2	0	0	0	0	0	98
	23	3	0	0	0	0	0	97
	13	2	2	0	0	0	0	96
	60	5	0	0	0	0	0	95
	24	5	1	0	0	0	0	94
	16	4	2	0	0	0	0	94
	88	6	0	0	0	0	0	94
	1	6	0	0	0	0	0	94
	94	2	0	4	0	0	0	94
	5	2	1	4	0	0	0	93
	40	3	1	4	0	0	0	92
	39	5	0	4	0	0	0	91
	73	4	2	4	0	0	0	90
	37	2	1	8	0	0	0	89

Figure 4

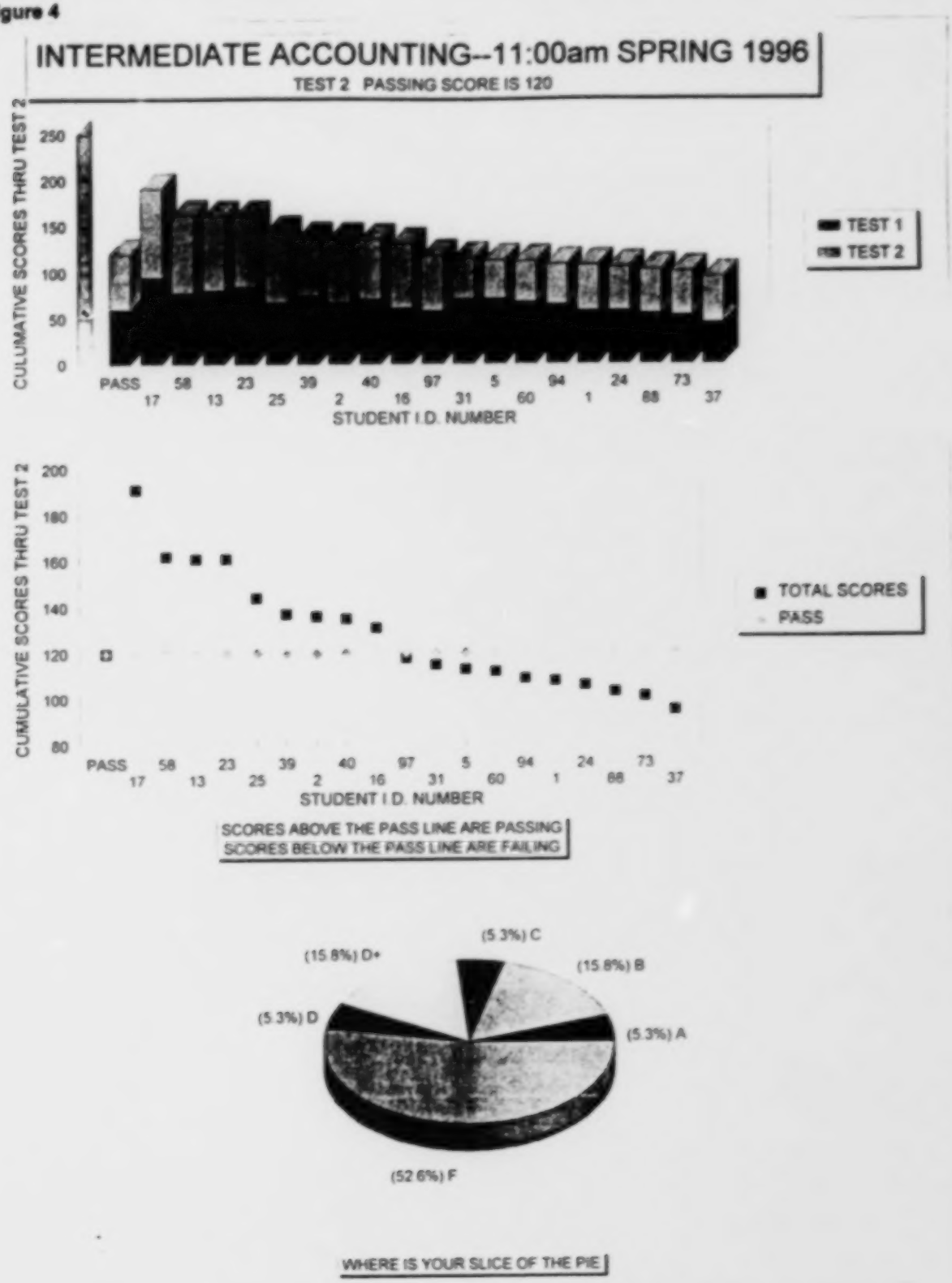

INTERMEDIATE ACCOUNTING--11:00am SPRING 1996
TEST 2 PASSING SCORE IS 120
CULUMATIVE SCORES THRU TEST 2
250
200
150
100
50
0
PASS 17 58 13 23 25 39 2 40 16 97 31 5 60 94 1 24 88 73 37
STUDENT I.D. NUMBER
TEST 1
TEST 2
CUMULATIVE SCORES THRU TEST 2
200
180
160
140
120
100
80
PASS 17 58 13 23 25 39 2 40 16 97 31 5 60 94 1 24 88 73 37
STUDENT I.D. NUMBER
TOTAL SCORES
PASS
SCORES ABOVE THE PASS LINE ARE PASSING
SCORES BELOW THE PASS LINE ARE FAILING
(5.3%) C
(15.8%) D+
(15.8%) B
(5.3%) D
(5.3%) A
(52.6%) F
WHERE IS YOUR SLICE OF THE PIE

Figure 5

COURSE NAME	INTERMEDIATE ACCOUNTING		
COURSE NUMBER	SBAD 332	WHAT-IF	
COURSE SECTION	001	CLASS HOURS	11:00am - 11:50am
SEMESTER	SPRING 1996	CLASS DAYS	M - W - F

NAME	I.D.	TEST I	TEST II	TEST III	TEST IV	TOTAL	A	B+	B	C+	C	D+	D
	17	95	96	0	98	289	81	73	56	48	31	23	6
	58	78	84	0	98	260	95	88	70	63	45	38	20
	23	85	76	0	97	258	96	89	71	64	46	39	21
	13	81	80	0	96	257	97	89	72	64	47	39	22
	25	68	76	0	98	242	104	97	79	72	54	47	29
	2	68	68	0	99	235	108	100	83	75	58	50	33
	39	75	62	0	91	228	111	104	86	79	61	54	36
	40	71	64	0	92	227	112	104	87	79	62	54	37
	16	61	70	0	94	225	113	105	88	80	63	55	38
	97	58	60	0	98	216	117	110	92	85	67	60	42
	31	71	44	0	98	213	119	111	94	86	69	61	44
	60	68	44	0	95	207	122	114	97	89	72	64	47
	5	71	42	0	93	206	122	115	97	90	72	65	47
	94	65	44	0	94	203	124	116	99	91	74	66	49
	1	58	50	0	94	202	124	117	99	92	74	67	49
	24	58	48	0	94	200	125	118	100	93	75	68	50
	88	55	48	0	94	197	127	119	102	94	77	69	52
	73	53	48	0	90	191	130	122	105	97	80	72	55
	37	45	50	0	89	184	133	126	108	101	83	76	58

Developing a CWIS -- It's not a Computing Center Project

Carol L. Smith
Bonnie M. Nealon
Computing Services
DePauw University
Greencastle, IN 46135
Voice: (317) 658-4294
FAX: (317) 658-4310
clsmith@depauw.edu
bonnienealon%leo@depauw.edu

Introduction:

Traditionally, developing and maintaining a campus wide information system (CWIS) has been the responsibility of a university's computing center. Indeed, the CWIS at many institutions began as a means for distributing very specific information relating to computing tools and services available to its more computer-savvy audience. The term "campus wide" often referred only to the fact that everyone on campus who had a computer account could access the CWIS. Then, the introduction of the World Wide Web (WWW) with its easy access to enormous amounts of information began to increase people's awareness of the possibilities of electronic information systems. Almost overnight, the audience of the traditional CWIS grew out of its campus boundaries to include off-campus visitors and became a worldwide audience including not only current students and staff, but alumni and prospective students, too. This newly expanded audience began to demand more than just information about computing resources available at their institution: They wanted to find up-to-date information about campus events, their classes and various other topics, and they also wanted to publish their own information. The CWIS essentially evolved from its simple campus-wide audience into a source of campus-wide information serving a world wide audience. It was no longer merely a way to distribute online computing help, but had become an important events calendar, educational resource, and marketing tool. The CWIS outgrew most computing centers' resources, so universities began restructuring their CWIS projects to include other members of the campus community for support.

Initial Development:

With these thoughts in mind, in December 1994 DePauw University began to develop plans for creating its WWW-based campus wide information system, DePauwINFO. Initial criteria for the CWIS deemed that it would focus on enhancing the academic environment at DePauw, while providing up-to-date postings about current events, services, and information about the University. The CWIS also should be available and easily accessible not only by all students, faculty and staff on campus, but also to alumni, prospective students and other visitors off campus. Thus, we gathered a team to begin the project. The team's two-part mission was to develop and set up the CWIS and to recommend a governance structure that would inherit the management of the system after initial start-up. We recruited thirteen team members whose interests were intentionally diverse to ensure

a broad representation of the entire campus community. Representatives on the team included a person from development/external affairs, student affairs, the registrar's office, the libraries, admissions, computing user support and system administration, and a faculty member and a student. This broad mixture of personalities and interests, we hoped, would lead to the necessary diversity in the design of the CWIS.

We conducted team meetings and other processes in a TQM atmosphere in which we treated all participants equally and everyone was encouraged to participate freely. Early on, we created working guidelines to ensure that everyone understood and consented to the project mission. Using notions such as "it is ok to disagree," "all ideas are respected," and "all decisions are made by consensus" helped us to create an environment that proved invaluable to the success of the project. TQM methodology emphasized a common team goal and mission and cultivated an overall sense of team ownership of the project. Ultimately, it was this sense of project ownership that was the one of the most vital keys to the success of our CWIS.

After formally defining and consenting to our team's mission, we proposed a project timeline that involved two key milestones: We would develop a prototype CWIS to show at public open houses during Alumni Weekend, June 1995. Then, using the experience learned from that development process and the audience' response as a basis, we would continue development over the summer and finish the production version by September 1995. Once the CWIS was in place, we would pass on the project to an ongoing governance team of our design.

We knew that these dates were ambitious: We were expecting to finish our project in just a third of the time that we knew many other universities had spent. Nonetheless, we decided to invest a big part of our initial development time to develop policies, procedures and a clear mission of the CWIS before concentrating on physically creating it. Having a solid mission would serve as a foundation from which we could better define contents and decisions in the following months.

To aid in defining the CWIS mission, we formed five subcommittees, each responsible for a major component of the development: "Purpose and content," "users," "presentation," "hardware/software," and "team management." Each committee was to meet separately to research issues and then make recommendations to the whole team for consensus during full team meetings. We used this TQM method of doing work outside team meetings to reserve the meetings for focused decision making rather than arenas for pointless discussion. Making efficient use of our time was critical if we were going to finish the project on time.

The subcommittees were defined as follows: The "purpose and content" committee was responsible for developing the initial policies of the CWIS. It dealt with issues of copyright, security and privacy of personal information, quality of contents, and standards. The "users" committee's initial purpose was to define the audience and what kinds of information would address its needs. It also addressed issues related to who would contribute information to the CWIS and how they would maintain accurate information. The "presentation" committee was to establish guidelines for page layouts on the CWIS. A CWIS is a publication of a university and it was imperative that every screen exhibited a quality presence of our institution. This subcommittee's goal was to design standard screen layouts that would simultaneously present a quality view of DePauw and a simple, consistent user interface. The "hardware/software" team had the responsibility of recommending and

installing the server hardware and software. This team also investigated appropriate development tools and began to experiment with creating documents. Finally, "team management" was the team leader, responsible for focusing the team on its mission and goals. This committee also served as liaison between the team and the rest of campus, periodically reporting our progress to the administration and coordinating CWIS publicity.

After several months of developing policies and standards, we began to create the prototype. The purpose of the prototype was twofold: First, it would be a trial run for the procedures that we had so painstakingly put together. Second, since we were still working in a grassroots mode and were not yet officially recognized by upper administration, we hoped to use it to impress our test audience (primarily alumni, faculty and administrators) and gain their support for the CWIS.

We brainstormed an extensive list of possible contents for the prototype CWIS. Then we assigned priorities according to categories of the items and whether they were readily available in electronic format. We were searching for information that would illustrate a diverse view of the overall campus and yet could be easily transformed into the appropriate hypertext format. Once we completed the list of contents, we contacted the appropriate owners of each piece of information and asked them to submit their items. We called these persons "information providers." Also, a new member whom we designated as the "html editor" was added to the development team. This person was to be responsible for coordinating other team members in acquiring the information, translating it into WWW format, and finally placing the documents on the CWIS. Our plan was that several team members would be involved in editing and testing the hypertext documents.

Unfortunately, this plan did work out as well as we had hoped. Although various persons expressed an interest in learning how to create WWW documents and promised to assist with the prototype, only a couple of team members actually did the work. One reason for this was that most of us on the team had other work commitments that superseded the priority of the CWIS, especially those of us whose departments were directly involved with the upcoming alumni weekend events. However, the "team management" committee speculated that another factor also was involved in this situation. A few team members alluded that the computing center should be responsible for providing WWW document editing services for the University. Apparently, they agreed that individuals or departments should have control over selecting appropriate information for the CWIS, but should not be expected to deal with technical issues such as editing hypertext documents. Indeed, these ideas were not out of line from other similar database and report-generating services that the computing staff provided to some campus departments. Having non-computing staff perform this type of task was a new concept for some of our team members and it was an understandable reaction for them to stand back and let the others work on it. Realizing this, we noted that this was an important issue that we must resolve to complete the project. However, with our deadline rapidly approaching, we decided that we could resolve it later and directed our attention to finishing the prototype. In about three weeks' time, we gathered data from numerous information providers, converted it to hypertext format, and placed it on the server. When finished, our prototype CWIS contained more than one hundred WWW documents, and it illustrated a variety of WWW capabilities ranging from simple text-based pages to ones with graphics, online forms, and searchable databases.

The completion of the prototype produced several positive results. First, after working on

policies for several months and finally having created a concrete product, the team was both elated and relieved -- We had not only reached an important milestone in the project, but we had also met our first deadline. Second, the audience's reaction was overwhelmingly enthusiastic. Alumni were especially positive about having easy access to university information, and many also commented on the educational possibilities that the CWIS would provide. Finally, the university administrators who viewed the prototype also were receptive to its possibilities and pledged their willingness to support the continuance of the project, both administratively and financially. Overall, it was a significant step toward the success of the project.

On the other hand, the prototype development also exposed an interesting challenge to the team. We realized that the method used to create and update documents on the prototype was not going to work well for long term maintenance of the CWIS. It was evident that one or two persons alone simply could not maintain the contents of a full-blown CWIS. As a solution, we proposed and agreed to take the "information provider" idea a step further by encouraging persons not only to submit their information but to create and maintain their own documents, too. Each piece of information on the CWIS would have a "sponsor" who actually owned the contents and would have the responsibility for document preparation and maintenance. Each sponsor, then, would designate an information provider (IP) who would do the necessary preparation and editing of documents. We proposed that the "html editor" role would be transformed into that of an "IP coordinator." That person would be responsible for assisting information providers in maintaining their documents, coordinating WWW and html training, coordinating the installation of editing tools at their desktops, and providing other assistance as needed. The IP coordinator's goal would be to enable the information providers to edit their own documents, but not to do the editing for them.

Coming to a consensus on this decision was not an easy task for the team. Although everyone agreed that our original plan needed adjustments, not everyone was convinced that persons in other departments could maintain their own files. Some found it difficult to ignore the old paradigm of persons being dependent on the computing center. Nonetheless, of the solutions we presented, this method appeared to be the most viable and the team consented to try it. As a compromise, we agreed to first test the procedures internally by using team members as the first new information sponsors before we collected other persons from campus. That way, we could work out the flaws in the plan using participants who would be more willing to experiment with different approaches than others outside our team might be. Since the campus was represented so completely by the development team members, we could still present an initial set of contents that exhibited a full view of the university. Using this technique, we planned to develop a solid set of procedures for information sponsors that the governance team could then evaluate and determine whether to adopt or redesign.

Thus, we began the last stretch of development, anticipating several major components: We needed to develop the appropriate training and development tools to enable information providers to begin developing their WWW documents. We had to complete key policy issues relating to governance of the CWIS. We needed to determine appropriate members and gather together the ongoing governance team that would inherit the project. Finally, we needed to begin educating our audience about the forthcoming CWIS.

We developed advertising bookmarks that were mailed to alumni and prospective students in early August. Notifying the alumni, perhaps our largest category of audience, about the coming

CWIS proved to be the catalyst that marked the reality of the project completion. Throughout the project, our goal date had always been September, but officially committing ourselves to that date finalized the deadline. Bringing the team to a consensus on the decision to advertise a startup date for the CWIS before it was finished was difficult. A few members of the team were skeptical about the proposed completion date and were concerned that the University would suffer embarrassment if we did not meet the deadline. Most of the team members, however, were confident about meeting our deadline and convinced those others to follow along. The doubters may have not agreed with our decision to advertise so early, but they consented that it was a necessary choice for the team to make.

For the last time, we evaluated the list of contents and selected items for the production startup. By late July, we had formally designated and contacted information sponsors based on that list. As was our plan, most of the sponsors were development team members. Still, we found that we also had to add a few non-team persons to the list to ensure that we had a cross-campus set of initial contents, so we held a startup workshop for all of the sponsors to explain formally their responsibilities. Sponsors were advised to meet with other members of their departments to explain the mission of the CWIS. The departments were to consider our list of initial contents for their department and update it to include items that they thought were most important. Then, each sponsor was directed to designate an IP and explain that role in the project. Once the IPs were designated, they were to be given release time to experiment with browsing the WWW to gather a better understanding of their role.

Training that first set of information providers proved to be an interesting challenge. By the time we finally began to work with them, the advertisements had been distributed and the September deadline was looming near. Also, since most of them had limited experience in using the Internet for anything other than exchanging E-Mail, we were not sure how quickly they would grasp the concepts of the World Wide Web and its capabilities. Nor were we sure about what kind of training would most effectively teach them. With the assumptions that sponsors had already outlined the goals of the CWIS and that IPs had spent time browsing the WWW, we began by presenting a two-hour workshop that focussed on the basics of creating html documents. The workshop briefly described the WWW and illustrated Lynx, the text-based browser that we were using. Its emphasis, however, was on explaining a Windows-based html editor and tools for creating and testing hypertext documents. At the end of the workshop, participants were directed to a computing laboratory where they could experiment with the tools covered in the presentation. Afterwards, we told them that we would install the appropriate tools on their own desktops as soon as possible. Meanwhile, they could return to the laboratory anytime to work on their documents. We encouraged persons to work in groups, stressing the advantages of exchanging ideas and solutions with other persons.

Soon after this first workshop, we realized that we had overestimated the basic knowledge of some information providers. We had not anticipated that some of them were unfamiliar with using Microsoft Windows. Thus, before we offered the next hypertext workshop, we provided an optional Windows workshop for those persons. Also, some Macintosh users had difficulty translating the demonstrated Windows-based commands to the Macintosh environment, so we provided an additional workshop that illustrated Macintosh-based tools. Finally, not all of the sponsors had described completely the role of the information provider to their IPs before sending them for training. In an extreme case, one information provider showed up for the workshop with literally no

avoidance of redundancy on the CWIS. It was proposed that we might establish one office or group to monitor for inaccuracies, and that we should encourage information providers to link to other information pages rather than duplicating them. The "outreach" committee was to address and resolve outreach issues such as soliciting new information providers, encouraging sponsors to keep their information current and accurate, aiding sponsors in identifying information from their area, instructing sponsors and IPs on copyright limitations, liability and slander, and training IPs to create hypertext documents. Finally, "student publications" was to resolve student involvement issues including the addition of student homepages, liability issues relating to those pages and encouragement for student groups to participate on the CWIS. Each subcommittee developed its own mission statement to keep it focused on its tasks. They have defined and prioritized the tasks necessary to complete their missions and assigned deadlines to each task.

Currently, the governance committee is involved with short term projects: the purchase of server hardware, the outreach for new information providers, and the issue of student involvement. However, we plan to resolve these issues quickly so that we can focus more on long range goals for the CWIS. The team should be more concerned with overall development of policies and procedures of the project and less involved with the day-to-day operations. Our team goal for the future is to anticipate potential stumbling blocks so that we can handle them in a proactive rather than a reactive manner. We also foresee that positions initially created to implement the production CWIS, such as the IP Coordinator, will evolve with new responsibilities to better meet the needs of the project. With the formation of an outreach subcommittee and the existence of new html software which make the creation of Web documents much easier, we may even find less need for formal training. Meanwhile, our most immediate goal for the CWIS is to establish it on campus as the definitive source of information about the University.

What We Learned:

Guiding a team using TQM methods can be a very rewarding way to complete a project. By building a sense of team unity that focuses all participants on a common goal, TQM often directs even the most diverse team members toward the successful completion of a project. Also, in our experience, the technique of employing a group of individuals with varying backgrounds to accomplish tasks results in more well rounded and better-prepared products. Nonetheless, TQM can pose challenges to teams made up of persons unaccustomed to working under its guidelines. For one, coming to a team consensus on every decision is often time-consuming and is not always a simple process. Persons who are more used to working in a democratic environment in which they decide quickly by voting are sometimes frustrated by the discussions and compromises needed to bring a team to a consensus. We also experienced a challenge in working with persons new to TQM that resulted from the makeup of the team itself. Our development team consisted of a wide range of individuals, many of whom were department directors. Those persons were not used to surrendering the "control" of handling tasks and working in an environment in which everyone was considered equal. They sometimes were uncomfortable with trusting others to accomplish tasks without their direct supervision. Hoping to avoid friction caused by these frustrations, our team leaders devoted a great deal of energy at the project startup to build TQM skills and guidelines for the team to follow. As the project progressed they had to be keenly aware of each team member's acceptance level and be prepared to resolve situations in which some found it difficult to adapt. At first, we were uncertain about whether these activities were necessary and were concerned that we had wasted valuable

project time. However, in retrospect, we firmly believe that the overall sense of project ownership and the resulting commitment of the team members, cultivated by TQM methodology, was the key factor that attributed the most to our CWIS' success.

Although we expected to encounter a few obstacles in providing necessary development tools to the information providers, we were startled by the shortage of appropriate equipment available to support those tools on our campus. We easily found Macintosh-based editing tools that would run on almost every Macintosh computer on our campus. However, we have many low-end DOS-compatible computers that are incapable of running the Windows-based editing software that we originally selected. This forced us to look into alternative, perhaps not so user-friendly, solutions for creating and testing hypertext documents on DOS computers. Unfortunately, we have found that the most sophisticated hypertext editors and browsers are available only for the Windows platform and that similar tools for the DOS-only platform are less user-friendly and provide fewer user options. For us, this presents a Catch-22 situation: The people who have a low-end DOS computers are likely to the ones who have had less opportunity to experiment with different computing tools and subsequently have less overall computing knowledge. Ironically, these persons are the ones who could benefit the most from having the sophisticated tools for maintaining their CWIS documents, yet they are the most difficult to sufficiently equip. We are currently investigating alternative solutions for those information providers, such as providing hypertext tools in the public computing laboratories or recommending to the administration that IPs should be high on the list of persons who receive updated equipment. So far, though, we have not completely resolved this situation at our university, largely because decisions made about equipment purchase often depend more on the university budget than on user needs.

Initially, to ensure that the topics presented would represent a broad range of campus information, we identified a contents list and highlighted items as key content documents for our startup CWIS. Still, when we introduced our CWIS, we found some obvious omissions of information about certain areas of the university, namely, student affairs, the school of music and student life. Additionally, after we had identified contents and began to determine the appropriate owner for each piece, we discovered that it was not always clear who owned the information. For example, we were told that one department was recognized as the official source of the University calendar, yet we found two other areas who also kept events calendars that they believed were more complete. In hindsight, we realize that we may have concentrated too much on identifying specific information for the CWIS. Instead, we might have gained more positive results by identifying university departments that should be represented and encouraging them to identify the specific contents themselves.

Looking to the future, at some point we will need to address the issue of measurement: Are we still focused on our original mission? What are our customer service goals and how will we know that we have achieved them? We may want to create an online visitors' survey to check if our off-campus users are finding useful information. We will also need to survey our students, faculty and staff to find out if they use the CWIS to find useful campus information and ask them what type of information they want to see on our Web site. We will need to track things such as the number of admissions inquiries that are received via the CWIS or how many "hits" we receive on our welcome page and other key homepages. The only way to ensure that we have created a successful product that is useful to our audience is to continually ask, "How can we improve?"

Finally, through the experience of this project, we are firmly convinced that developing and maintaining a CWIS is not a computing center project. Certainly, the computing center plays a critical role by supporting the technology of the CWIS, maintaining the server hardware and software, investigating updated client programs and development tools, and providing support and training for the information providers. However, without intending to downplay the importance of that support, technical support is merely a small portion of the diverse range of services necessary to maintain the system. A good CWIS requires that all areas of campus are equally represented and supported by its contents and services. Ensuring that goal requires that a diverse group of individuals from all parts of the institution be responsible for the key decision making that drives the CWIS.

The Shift to a Learner-Centered University: New Roles for Faculty, Students, and Technology

Karen L. Smith
Faculty Associate to the Provost for Faculty Development and Associate Professor of Spanish
klsmith@ccit.arizona.edu
520-626-8023
CCIT 332
The University of Arizona
Tucson, AZ 85721

J.Timothy Kolosick
Director, Treistman Arts Center for New Media, and Professor of Music
kolosick@u.arizona.edu
520-621-7018
School of Music 137
The University of Arizona
Tucson, AZ 85721

The Process

Multimedia, the Internet, computer conferences, listservs, relational databases ... Rapid advances in educational technology have opened an entire universe of information retrieval and use possibilities to instructors and students. Instead of being confined and constrained by the limits of a traditional curriculum and texts, teachers can free students to explore their own interest areas, tap background resources, consult with experts, and collaborate with peers. Teachers no longer need to be catalysts, vehicles, and judges for the learning process. Instead, they can encourage learners to be explorers driven by curiosity and personal interests. Students can assume responsibility for meeting their own needs and for finding that life-long learning is indeed fun. Interaction, instruction, collaboration, investigation, and learning opportunities can all play a decidedly positive role in learning.

Yet this ready access to information and learning independence can easily overwhelm teachers and students as they struggle to organize and filter the flood of possibilities. Some teachers refuse to take advantage of these information supplements, fearing obsolescence if machines prove to be more efficient knowledge deliverers or, worse, if they actually become 'smart' enough to teach.
Teachers must become comfortable with information access freedom and actively train their students to manage and filter information. Otherwise, learners may find themselves faced with new, uncomfortable situations when they must choose what is important to learn from a wealth of data.
Together faculty and students face new challenges and questions regarding their roles in the emerging learning paradigm. What is teaching? What is learning? What is an expert? How can I learn what the experts don't know? How do I deal with so much knowledge? How can teaching and learning be personal experiences in an over-crowded classroom or through technology supports? Are professors really becoming obsolescent?

Shift 1: The Teacher: From Deliverer to Learning Facilitator and Guide

Traditional classes focus on the teacher as the primary information source. It is up to the teacher to lead students via the curriculum and texts toward a predetermined outcome. Students' success or failure is marked by their ability to master a body of information presented in lectures or texts.

Under this traditional approach, success depends heavily on the teacher's ability to engage the class in a process of knowledge assimilation. Teachers often concur that failure occurs because students don't enter a class with 'adequate' preparation. Or perhaps they aren't as good as students were in the 'old days'? ... Or perhaps a single instructional approach cannot serve all learners.

In a teacher-centered class, learners often function as passive receivers, a role works well for some, but not all as evidenced by absenteeism, boredom, and the failure to acquire a specific knowledge set. In teacher-centered environments, professors assume responsibility for determining all learning goals, delivering what they determine to be crucial information, providing feedback, and assessing all production and learning outcomes. Students have little or no role in designing or influencing content, materials, or approaches. What interaction does occur between deliverer and receiver is often a function of class size rather than a means of supporting students' learning needs.

However, this shift to a learner-centered class demands a shift in teachers' time management and preparation techniques. It requires a shift in expectations on the part of the teacher as well as the student, and in strategies for old techniques and delivery systems no longer suffice to meet global needs, nor do old assessment paradigms accurately measure outcomes that are determined by individual learners. Collaborative, cooperative, and problem-based learning research suggests that allowing students to actively participate in the learning process encourages the activation of background knowledge, advance organizers, and information schema that help with the assimilation of new knowledge. As more responsibility falls on the learner to pursue interests and explore wide varieties of information, teachers must re-think their roles and shift to a focus on facilitation and guidance rather than on delivery. Preparation time increases while lecturing declines or, in some cases, even disappears. Evaluation procedures require less time as collaboration and cooperation activities decrease the number of papers and projects to correct. Peer editing and evaluation procedures can improve the quality of the output, thus further changing the way faculty engage in corrections, guidance, and feedback.

Thus, the role of 'learner' shifts to both student and teacher as information exploration/discovery and experiential learning opportunities supplement or even replace teacher-driven information delivery. With a focus on exploration, discovery and learning, all participants have opportunities to share and evaluate new information and to offer new interpretations and critical analyses for old ideas.

Shift 2: The Student: From Passive to Active Learner

It is vital for teachers to be familiar with learning theories as well as with approaches that enable students to learn in ways that suit their personalities and personal goals. An understanding of how learning occurs provides teachers with a blueprint for enabling students to take advantage of their own innate abilities, styles, and strategies.

Current research has divided learning styles into four general categories:

Concrete perceivers learn best through direct experience, doing, acting, sensing, feeling;

Abstract perceivers are skilled at analysis, observation, critical thinking;

Active processors are eager to apply new information to facilitate tasks; and

Reflective processors prefer to reflect, think about new information.

Traditional, delivery-oriented education tends to select procedures that best serve those learners who are abstract perceivers and reflective processors. Because of the tendency toward receptive participation, traditional classes can deny or limit contact with the active, hands-on, experiential approach that many students require to facilitate successful learning. Traditional assessment techniques often stresses information retrieval and analysis rather than the ability to apply new concepts to real world or simulated tasks. A single approach to teaching and assessment can result in failure when the same students who might very well excel in a different environment that stresses productive approaches to learning and assessment.

In order to offer all learners the opportunity to succeed, it is vital that teachers provide a wider approach to information access, acquisition, and application processes. Thus, their attention has now shifted to the learner and how to provide a student-centered environment that offers a more eclectic approach to the learning process . Such an environment should accommodate all perceiving and processing styles through a variety of activities and materials. The curriculum that becomes a creation of teachers, learners, and real world needs and places an emphasis on skills of intuition, feeling, sensing, imagination and synthesis, as well as on the traditional skills of analysis, reason, and sequential problem-solving. Thus, students have an opportunity to benefit from all learning styles while facilitating the process of by using the ones with which they are most comfortable.

Therefore, learner-centered instruction provides a connection between all learning styles through experiences, opportunities to conceptualize, experiment, and reflect on discoveries. Students employ all senses, aural, visual, and tactile, in order to participate in all aspects of the learning and comprehension processes. Finally, teachers apply multiple kinds of assessment that emphasize the development of global capacities utilizing all four learning styles, productive as well as receptive.

Freeing learners to use person styles is only one aspect of the successful learner-centered environment. Since learners differ widely in the variety of strategies they choose to apply in a given learning situation, their success also depends on their ability to activate appropriate strategies to think about how to learn (metacognitive strategies), become engaged in the learning process (cognitive strategies), and to interact effectively with peers and experts (social and affective strategies).

Technology makes it possible for students to learn according to their own styles and to apply personal strategies. Once teachers could only hope that students would activate their internal ability to think about learning. Now the technology enables teachers to encourage and even guide activation of metacognitive planning and organization strategies. It provides organizational structures for cognitive approaches to learning. It facilitates and establishes environments for social and affect interactions that would otherwise be difficult if not impossible in a large class. The following table suggests how some of the currently available technologies can provide learning environments that trigger different types of strategies.

Learning Strategies and Technology Supports

Metacognitive Strategies

Strategy	Description	Suggested Technology Supports
Selective attention	Focus on special aspects of learning tasks as directed by teacher, peers or personal interests.	Presentation software, hyperlinked text
Planning	Planning for the organization of either written or spoken discourse.	Outliners, graphs, flowcharts
Advance organizers	Preview main ideas and concepts of the material to be learned	Hypertext, multimedia links, web materials, summaries
Monitoring	Review attention to a task, comprehension of information that should be remembered, or production while it is occurring.	Word processors, PDAs, imaging, review of hyperlinks
Self-monitoring	Check one's comprehension during listening or reading or check accuracy and/or appropriateness of one's oral or written production while it is taking place.	E-mail, spelling and grammar checkers
Evaluation	Check comprehension after completion of a task, or evaluating production after it has taken place.	Conferencing, e-mail, peer editing through collaborative writing tools
Self-evaluation	Check outcomes of one's own learning against a standard.	Real world examples and simulations

Cognitive Strategies

Strategy	Description	Suggested Technology Supports
Rehearsal	Repeat information to remember	Conferencing, e-mail, listserv, video
Resourcing	Use information in text or in supplemental materials to guess the meaning of specialized linguistic items, predict outcomes, or complete missing parts	Dictionaries, encyclopedias, reference materials, background materials, hyperlinks,conferencing/ e-mail for peer support
Summarizing	Intermittently synthesize what one has heard to ensure the information has been retained	Word processing, PDAs, outliners, flowcharts, images, graphs
Note taking	Write key words and concepts in abbreviated verbal, graphic, or numerical form during a listening or reading activity	Word processing, PDAs, outliners, flowcharts, images, graphs
Deduction	Apply rules to understand material.	Problem solving software,

		simulations
Induction	Arrive at a rule through the organization of concepts.	Word processing, PDAs, outliners, flowcharts, images, graphs
Imagery	Use visual images (either generated or actual) to understand and remember new verbal information	flowcharts, images, graphs
Transfer	Apply old information to new task	Problem solving software, simulations, computer conferencing and e-mail discussions
Elaboration	Link new information, or integrate new ideas with known information	Problem solving software, simulations, computer conferencing and e-mail discussions

Social/Affective Strategies

Strategy	Description	Suggested Technology Supports
Cooperation	Work with peers to solve a problem, pool information, check notes, or get feedback on a learning activity.	Conferencing, e-mail listservs, decision software, simulations
Questioning for clarification	Elicit additional explanation, rephrasing, or examples	Conferencing, e-mail listservs
Self-talk	Use mental redirection of thinking to assure oneself that a learning activity will be successful or to reduce anxiety about a task.	Word processing, outliners, flowcharts
Self-reinforcement	Provide personal motivation by arranging rewards for successful task completion and learning.	Games, conferences e-mail

Shift 3: Technology: An Infrastructure for the Learner-Centered Class

We cannot effectively, efficiently and successfully create a truly learner-centered environment without access to appropriate technologies. Technology provides easy access to tools, information, and communication environments through which students gain new learning opportunities. However, this increased access creates the need for teachers and students to develop effective technology use and information management skills. How can technology transform a lecture-based class into a learning experience? Let's look at a few of the many possible opportunities for a shift to interaction through technology

Traditional Approaches	Technology Supported Opportunities
Lectures	**Lectures for guidance purposes supplemented with**
1. Delivery	1. Video delivery
2. Students may take notes	2. Lectures on web
	3. Presentation software enhancement
	4. Information organization activities
Text-based readings	**Texts and real world materials**
1. Reading	1. Library
2. Summaries	2. Databases
3. Reports	3 Web-based materials
4. Answers to questions	4. CD-based materials
Discussions	**Collaboration and Discussions**
1. Face-to-face	1. Face-to-face
2. Teacher-to-students	2. E-mail (one to one)
3. Small groups	3. Listservs (one to many)
4. Pairs	4. Computer conferences (interactive)
5. Debate format	5. Video conferences (interactive)
6. Reporting structure	6. Web-based reports and reactions
Research	**Research**
1. Library	1. On-line databases
2. Labs	2. Simulations
3. Interviews	3. Contact with experts through web-pages or directly
	4. On-line articles
	5. Library searches
Experiments, problem-solving, critical analysis	**Experiments, problem-solving, critical analysis**
1. Labs	1. Cooperation and collaboration
2. Homework	2. Simulations
3. Projects	3. Guided analyses
Feedback	**Interaction, collaboration, feedback**
1. Office hours	1. E-mail
2. Written responses	2. Participation in on-line discussions
3. Discussion responses	3. Face-to-face discussions
	4. Teachers, peers, experts

Video and computer conferencing create on-line collaboration environments for information sharing, data collection, decision-making, problem-solving, and more. Networked software that facilitates decision-making and problem solving through simulations, games and guided activities provide additional opportunities for teachers and students to interact with each other during and beyond the time and space confines of the class. Thus, problem-solving, critical analysis and assessment become on-going, task-oriented events that can involve experts and other collaborators with different focuses and knowledge. Active involvement of teachers, experts, and learners in problem-solving, analysis and organization processes helps learners acquire life and work skills while applying new information in novel ways. Thus students move beyond reception to use and become involved in a personal and meaningful learning experience that can lead to information retention.

Technology can facilitate the growth of personal interactions. Our challenge as teachers is to find ways to maximize the learning potential of students by using appropriate technologies as teaching and learning tools that make learning tasks, information access, and communication easier, more inviting, fun, and effective.

In the past, we have chose available technologies and then attempted to create uses for whatever is accessible. The technology has manipulated teachers, resulting in teaching environments that impose computers, audio/video supplements on traditional delivery formats. Now we are prepared to control the technologies and to make selections that further our instructional goals while offering learners the opportunity to utilize their personal styles and strategies.

We have a greater understanding of how learning occurs, how technology can enhance access and productivity. The life of the student changes as the technology facilitates a focus on their needs and transfers responsibility for learning to them. Gone are the days of memorizing facts for an exam ... and forgetting them immediately. Learning becomes a process of acquiring the tools necessary for find, selecting, organizing and applying information that is appropriate for solving a problem, analyzing data, criticizing decisions, and more. The large lecture class transforms itself into a personalized experience. Students receive directions from the professor through a traditional lecture, personal contact, by accessing a video or on-line information. They collaborate with peers either face-to-face or through on-line means. They find and organize information that addresses their needs and interests then apply that information to solve problems, analyze information, and reach decisions. They do this from home or within the classroom. They are responsible for completing projects in order to participate with their teams in information application activities. They become responsible for supporting their peers by completing their share of the learning tasks and for assessing the quality of their peers production. Learning becomes a group effort that demands input from all members in order for all of the pieces to fall into place. This requires student as well as teacher input into the evaluation process since the groups will not necessarily produce the outcomes envisioned by the teacher.

Shift 4: Providing Support for Change: The Faculty Development Partnership

The transformation into a learner-centered environment cannot happen without a change in the roles teachers play in the learning process. Nor can it occur with out access to technology as well as to support personnel for the development of new learning environments. Teachers must be inspired to change through an understanding of how new instructional approaches will further their goals and aid their students in attaining desired outcomes. They must be trained to select then use appropriate technologies to create new learning environments. And finally they must be given the opportunity to become independent users of expert tools for the purpose of creating new learning environments. Development of teachers requires a complex training, development, and sustainment program that supports emerging as well as advanced developers in their endeavors to create and deliver new couseware.

As a first step toward transforming itself into a learner-centered research university, the University of Arizona has shifted its focus to enhancing the learning process rather than continuing to concentrate on modifying traditional teaching or presentation methods. Students and faculty are encouraged to become life-long learners, using technology in the learning environment to facilitate

information access and organization, data collection and analysis, and communication between learners. Students find new opportunities to pursue their individual learning interests and to enhance their experiences by using technology that is associated with their own career goals as a means of accessing information, solving problems, and communicating with peers and experts. Faculty are supported in their instructional change endeavors by a campus-wide Faculty Development effort that meets changing instructional needs as instructors shift their attention from curriculum driven goals to learner needs.

As a means of supplying support for a variety of individual projects, the administration encouraged faculty and support personnel from a variety of units to establish the Faculty Development Partnership. This Partnership provides a flexible technological and pedagogical infrastructure for instructional research and curriculum development. The Faculty Development infrastructure is an extensive network of partners and referral units that provide faculty with the technology access, funding, and personal support. Through this infrastructure, faculty become familiar with new learning theories, innovative teaching methods, curriculum design techniques, and technology use.

Participating units in the Partnership include:

The Center for Computers and Information Technology provides telecommunications and campus network support as well as general consulting through the HELP desk, advanced computing and consulting through its Multimedia and Visualization Lab, and access to current software library through the Faculty Resources for Instruction. CCIT Research Support assists in the design and analysis of instructional research projects.

The University Library serves as a gateway to electronic information sources worldwide. Librarians develop and support information literacy among faculty and students, emphasizing life-long learning in a technology based, global information society.

The University Teaching Center offers the New Technologies Training Program for faculty who are new to high technology teaching tools. In addition, all faculty can obtain the most current information on learning theories and teaching methods through the Center's library and seminars.

The Peter Treistman Fine Arts Center for New Media specializes in animation, video and audio editing, and graphics design. Faculty use high technology artistic tools to refine their instructional materials for clear, effective visual communications.

VideoServices supports the University of Arizona faculty through production and transmission of local and distributed learning environments. Satellite, microwave, digital video, cable, and wireless cable technologies are used to distribute education material. VideoServices is an educational broadcast resource of the University of Arizona and member of the KUAT Communication Group.

The Partnership Coordination Office coordinates all research and workshop projects. It administrates the activities of the Partnership and its interaction with other organizations for curricular change, such as the Instructional Resources Coordination Council, the Faculty Development Team, the University Composition Board, and the Faculty Fellows. It also participates

in efforts to create partnerships with corporations and community groups to establish an extensive external support network for faculty projects.

The uniqueness of the Faculty Development support infrastructure lies in the its comprehensive programs and creative use of resources. Established programs include symposia and workshops for information distribution purpose; training programs for new users; a grants program to initiate and expand curriculum change projects; and expert support for faculty seeking to bridge the chasm from emerging users to independent courseware creators. The Faculty Development Partnership provides the infrastructure by coordinating all support activities. The five independent units mentioned above have abandoned traditional roles in order to focus on providing collaborative and cooperative support for faculty. The units have worked to identify common goals and individual strengths in order to provide maximum support for all projects without duplicating effort or ignoring any need. The result has been a smooth transition system that attracts novice as well as intermediate and advanced users and directs individuals to appropriate support structures. Those who enter the system are mentored by members of the Partnership and nurtured through out the life of their project.

Novice users may enter the Faculty Development support system by seeking services from a variety entry points. Typically, a group will learn about Faculty Development initiatives through a symposium, workshop, or through a department or college-wide meeting with the Partnership Coordinator. Basic training options include e-mail and Internet training through the University Library, computer conferencing training through the Center for Computing and Information Technologies, and a global approach to technology use through the New Technologies Training Program. The latter that involves all Partners in a comprehensive introductory program. There, faculty receive hands-on training in the selection and use of appropriate technologies for teaching/learning enhancement. Topics include basic computer use, teaching methods, presentation software use, decision lab strategies, and Internet strategies. Graduates of this program receive a development package (computer, printer, and scanner) as an incentive to apply their new skills immediately.

Intermediate users receive support in multimedia production through CCIT and the Treistman Center. These two units collaborate to provide design support for faculty who have received basic training in software use, HTML programming, and Internet strategies through one of the previously mentioned programs. At this level, faculty focus on creating interactive packages that promote learner independence and incorporate opportunities to use personal learning strategies. UTC and volunteer faculty help developers at this level design products that are theoretically sound instructional packages.

Advanced users collaborate with programming, animation, and graphics design experts from CCIT and the Treistman Center and with support personnel from corporate partners to develop innovative instructional packages that emphasize new uses of the technologies. These partnerships yield learner-centered courseware that in turn creates the need to establish new training standards and procedures for the faculty who follow. Once these new tools are created, Video Services, CCIT, the Treistman Center and the Library help faculty design unique delivery options that maintain personal contact while transcending the limitations of time and distance.

Shift 5: Evaluation of Students and Faculty

One critical area of learner-centered environments is testing. How do you test students who tend to forge their own individual path through knowledge? How do you determine wise application of facts? How do you demand that they know particular facts when learning is so individualized? First, the course need not exclude simple memorization of facts. This aspect can assure a common database from which the students work. The problem is that it often excludes other data from the students path. Students have other courses to study for and they will most often do the minimum for each course.

One of the best ways of testing students in this environment is the electronic portfolio. Students can have a set of assignments that include an annotated bibliography for the course readings, a position paper on some topic, a research report, and the like. All such assignments can exhibit both textual and visual communication skills. Stored on a server, the portfolios can be easily monitored and critiqued throughout the semester, achievers can be rewarded and sluggards encouraged. The portfolio design can be given in strict or loose terms. The bottom line is "the clear and wise demonstration of the application of concepts associated with a given field."

A mother of five once persuaded her five-year old to do his chores and then remarked to me, "Children will do anything willingly that they feel allowed to do." One role of the instructor is to put students in an environment where they perceive a need to know something, where they have the desire to discover using modern tools of their trade, and where they feel the freedom to be creative in their presentation of knowledge to others. Isn't this what we seek in our own professional work?

Our primary teaching interest should be in allowing others to learn important subject matter and not in establishing our position of authority in an area of study. Fields of study change quickly. What if the student discovers a web site with information which contradicts points in your lecture? May he or she come to you with that information? Is it not important for students to learn the methods of respectful presentation of an opposing viewpoint as well as the concepts on your syllabus?

Such interaction changes the role of students from passive to active learners. Teachers shift from information deliverers to learning facilitators and guides. High technology helps create a learning infrastructure that allows more communication between learning parties than previously possible. Our next step will have to involve the establishment of new assessment criteria that take into account strategies, styles, and the unique learning opportunities offered by technology. Tools that are based on the criteria of the old, teacher-centered learning paradigms do not serve in the learning world of the twenty-first century. The collaboration, cooperation and team-oriented research that the corporate world now values are called 'cheating' under the existing evaluation paradigm.

Nor can we continue to evaluate and reward faculty under the traditional system. Higher education leadership must recognize the emphasis on preparation and the research that goes into creating an interactive, course that takes advantage of background information and data from a variety of disciplines. Time in the classroom must cease to be a criteria for how hard a teacher works. Learner-defined outcomes must become an indicator of success. Teaching must be seen as part of the life-long learning process rather than as a means of delivering specific information.

Shift 6: Overcoming Obstacles

Moving from a traditional education system to a learner-centered one requires profound change in a number of areas. Students become partners in the learning process who develop information management, critical thinking and critical analysis skills. Teachers learn to select and employ technologies in order to free learners to use their own strategies and styles. Institution adopt an attitude of support, guiding and helping faculty as they strive reach expert levels of control of learning theories, methods, curriculum design techniques, information search, retrieval, and organization procedures, and courseware design. Rewards systems change to recognize and honor innovative teaching and course development efforts.

No one unit can provide such a comprehensive support system, thus it is vital that units combine efforts to create a comprehensive infrastructure. An integrated approach based on partnerships, mentoring, and resource sharing avoids duplication of effort and surrounds faculty with the support they require to create innovative learning environments that meet learner needs. We members of the Faculty Development Partnership at the University of Arizona suggest that faculty development efforts ...

- a leader in the central administration to carry the message to 'high' levels;
- integrate all aspects of technological and instructional support into a single support system;
- focus on faculty volunteers who are willing to take risks;
- enable creative development initiatives;
- provide easy and adequate access to appropriate technologies;
- focus on goals rather than on territories;
- emphasize faculty-to-faculty mentoring opportunities to expand the support system into individual disciplines;
- encourage and design changes in the institution's rewards system;
- cultivate external partnerships with corporations and community.
- move through three recursive stages of development:
  - basic training in theories, methods, curriculum design, technology use;
  - innovative applications of new skills and knowledge;
  - independent use of expert tools.

Collaboration, Cooperation Learning Bibliography

Adams, D. M., & Hamm, M. E. (1990). *Cooperative learning: Critical thinking and collaboration across the curriculum.* Springfield, IL: C.C. Thomas.

Brooks, Ann, & Watkins, K E. (Eds.) (1994). *The emerging power of action inquiry technologies.* San Francisco, CA: Jossey-Bass.

Bruffee, K. A. (1993). *Collaborative learning: Higher education, interdependence, and the authority of knowledge.* Baltimore, MD: Johns Hopkins University Press.

Chi, M., Glaser, R. & Farr, M. (1988). *The Nature of Expertise.* Hillsdale, NJ: Erlbaum.

Davidson, N., & Worsham, T. (Eds.) (1992). *Enhancing thinking through cooperative learning.* New York: Teachers College Press.

Hamm, M., & Adams, D. M. (1992). *The collaborative dimensions of learning.* Norwood, NJ:

Ablex Pub. Corp..

Hertz-Larowitz, R., & Miller, N (Eds.) (1992). *Interaction in cooperative groups: The theoretical anatomy of group learning*. Cambridge, England: Cambridge University Press.

Johnson, D. W., & Johnson, R. T. (1994). *Learning together and alone: Cooperative, competitive, and individualistic learning*. Needham Heights, MA: Allyn and Bacon.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (1991). *Cooperative learning: Increasing college faculty instructional productivity*. Washington, DC: George Washington University.

Kaye, A. R. (Ed.) (1992). *Collaborative learning through computer conferencing*: The Najaden papers. Berlin: Springer-Verlag.

Kolb, D.A. (1984). *Experiential Learning*. Englewood Cliffs, NJ: Prentice-Hall.

McGilly, K. (Ed.), (1994) *Classroom Lessons, Integrating Cognitive Theory and Classroom Practice*. Cambridge, MA: Bradford Books/MIT Press.

Messick, S. (1976). *Individuality in Learning*. San Francisco: Jossey-Bass.

O'Malley, C. (1995). *Computer supported collaborative learning*. Berlin: Springer-Verlag.

Olson, Gary A., & Dobrin, Sidney I. (Eds.) (1994). *Composition theory for the postmodern classroom*. Albany, NY: State University of New York Press.

Ryder, K. G., & Wilson, J. W. (1987). *Cooperative education in a new era: Understanding and strengthening the links between college and the workplace*. San Francisco, CA: Jossey-Bass.

Scardamalia, M. & Bereiter, C (1993). Technologies for knowledge building and discourse. *Technology in Education*, 36 (5), 37-41.

Scardamalia, M., Bereiter, C., McLean, R. S., Swallow, J, & Woodruff, E. (1989). Computer supported intentional learning environments. *Journal of Educational Computing Research*, 5(1), 52-68.

Schmeck, R. R. (1986). *Learning Styles and Learning Strategies*. NY: Plenum.

Sharan, S. (Ed.) (1990). *Cooperative learning: Theory and research*. New York: Praeger.

Sharan, S. (Ed.) (1994). *Handbook of cooperative learning methods*. Westport, CT: Greenwood Press.

Sharan, Y., & Schlomo, S. (1992). *Expanding cooperative learning through group investigation*. New York: Teachers College Press.

Slavin, R. E. (1995). *Cooperative learning: Theory, research, and practice*. Boston, MA: Allyn and Bacon.

Thousand, J. S., Villa, R. A., & Nevin, A. I. (Eds.) (1994). *Creativity and collaborative learning*. Baltimore, MD: Paul H. Brookes Pub. Co.

Verdejo, M. Felisa, & Cerri, Stefano A. (Eds.) (1994). *Collaborative dialogue technologies in distance learning*. Berlin: Springer-Verlag.

Weinstein, C.E., Goetz, E.T., & Alexander, P.A. (1986). *Learning and study strategies*. NY: Academic Press.

Witkin, H.A. & Goodenough, D.R. (1981). *Cognitive styles: Essence and origins*. NY: International Universities Press.

A PROCESS EDUCATION APPROACH TO TEACHING COMPUTER SCIENCE

Peter D. Smith
Mathematics Department
Saint Mary's College
Notre Dame, IN 46556
(219) 284-4493
psmith@saintmarys.edu

Introduction

Throughout this paper, I will be discussing "Process Education." The collection of concepts, techniques, and way of thinking which comprise Process Education (PE) is the brainchild of Dr. Daniel Apple, President of Pacific Crest Software, Corvallis, OR. Much of what I have been able to accomplish in my own teaching results from my participation as a learner, mentor, and author in the many teaching institutes which he has sponsored.

"Process Education encompasses the philosophy that learning, thinking, problem solving, communicating, assessing, and teamwork are processes to be developed and continually improved by students as they construct knowledge. Process Education incorporates cooperative learning, discovery-based learning, journal writing, and extensive assessment." [1, 5]. I have successfully applied the processes mentioned in the last sentence to the teaching of Computer Science.

The driving force of process education is its focus on student learning. This results in a revolutionary way of viewing teaching. Instead of the traditional lecture approach, a teacher whose primary concern is student learning must first come to believe that every student can learn, and that a teacher's job is to facilitate learning by helping students develop learning skills to such an extent that they become capable of designing their own learning processes. We call this type of education "learning to learn." [2, 12]. If our colleges and universities can graduate students who will become life-long learners, we will be meeting the challenge that modern society has set out for us.

One of Dan Apple's models that I find helpful is the labeling of stages in the learning process as follows:

1. Trained: Ability to perform tasks without understanding.
2. Learned: Gaining understanding by being told. Rote learning.
3. Learner: Discovering concepts in a controlled setting.
4. Enhanced Learner: Asking own critical thinking questions.
5. Self Grower: Ability to develop own learning processes.

These stages fit the learning of Computer Science especially well. Often workers can be trained to use a software package without understanding what makes it work the way it does and often without even wondering about this question. Sometimes, beginning students in computer literacy courses

fall into this role. Of course, when another release of the package arrives, or when they are forced to use a different package to accomplish their task, they are lost.

One way to help students understand the concepts underlying their work is to tell them. The lecture method of teaching has perfected this type of rote learning. We tell the students what they are to know. They write it down in their notebook. We ask them to repeat it on a sequence of quizzes and tests. The problem with this type of learning is that it is very short term. It has been verified that five years after graduating from college, only five percent of what a worker needs to know to do her job has been learned in college. The other 95 percent must be learned on the job. If a student has been a passive learner in college she will be ill-equipped to learn on the job.

A student who has had to discover the concepts she has learned in college will have developed skills which will help her to become a life-long learner. Discovery learning is often a closely guided process in which the facilitator (teacher) prepares a model and set of critical thinking questions which students work through in teams to gain mastery of the concept, tool or process being modeled. Closed lab activities are examples of discovery learning. If the lab is a means for students to practice what they were taught in lecture (Lecture Centered Learning), they find it hard to move to the "learner" stage. On the other hand, if lectures are used to further explore concepts discovered in the lab (Lab Centered Learning), students move much further along the path to becoming life-long learners.

Students who have learned to ask their own critical thinking questions are ready for independent research projects. Many computer science students do independent projects in groups and become enhanced learners in this way. They also gain experience working in teams and corporate recruiters value these teamwork skills.

The highest level of learning is called the self grower stage. Students who have reached this level realize that knowledge is divided into concepts (what is to be learned), tools (skills and resources needed to learn well), processes (step by step plans to accomplish a goal), and contexts (real life settings for the concepts, tools, and processes). Of these, the most difficult to master is the construction of processes, because this construction is a process in itself. Computer Science is well suited to developing this appreciation for abstraction since the development of algorithms is at the core of the discipline. With careful planning a good Computer Science program should graduate class after class of self growers.

In this paper, I will describe my own approach to teaching Computer Science including classroom management, how I have adapted four different courses to follow the process education approach, what successes I have acheived, and how students have responded.

Classroom Management of Process Education

In the introduction I have attempted to suggest the reasons why I have made the paradigm shift from a lecture mode of teaching to process-oriented mode. I found that students had difficulty moving from the Learned to the Learner stages of growth when I depended totally on lectures. First, I introduced closed labs into all of my courses and experienced the shift from lecture-centered to lab-centered teaching. Then, I began to assign team projects, especially in Systems Analysis and Design

and Data Base, and I also began to use pairs or sometime triples in the lab.

At the same time, I attended some of the teaching institutes sponsored by Pacific Crest, and experienced the benefits of discovery learning. This is "a critical and unique aspect of process education in that it is the students and not the faculty who access appropriate information, and through suitably designed conceptual models or processes discover these new concepts by themselves." [1, 19]. The faculty member does not answer any questions during the discovery time. He or she asks critical thinking questions and encourages the students to "try it." In order for this approach to be successful, students should work in cooperative groups so they can build on each others' strengths and ideas and hence learn faster and better. "The characteristics of a cooperative-learning environment include individual accountability, high-level communication (face-to-face interaction), mutual interdependence, a focus on recognizing and developing process skills, ongoing reflection on the cooperative process, ownership of performance, and a shared community." [1, 19]

A final component which made this paradigm work for me is the emphasis on assessment. Each member of each student team has a defined role to play. I use four person teams and the roles (which different members assume each class) are: team captain, recorder, reflector and spokesperson. (See Appendix A for a description of the criteria for each role). The reflector makes periodic reports during the class. Each report contains an important strength exhibited by the team in the last 15-20 minutes which enhanced the learning process; an area most in need of improvement; and an insight about team learning.

At the end of each class, the team produces a report of the work products for the class period. These include the recorder's notes answering the critical thinking questions pondered by the team; the reflector's notes giving the strengths, areas for improvement, and insights; a grade on a scale of 5 which the team assigns to its own work during the class and a reason for the grade. I double their grade if it agrees with what I have observed about the team during class and with the quality of the team report. Otherwise, I give them the grade they assign themselves. It is seldom that I don't double the grade.

In addition, each student keeps a journal with an entry for each class which includes their individual assessment of how well they contributed during each class, their assessment of how well their team worked, an assessment of me as the facilitator, and an assessment of the discovery-learning activity. This forces each student to become aware of her learning process and keeps the focus of the course on learning.

A typical 75 minute class period is organized as follows: A brief review of what we learned last time and a few key points for the current class (5 minutes); a team quiz (10-15 minutes) on the reading assignment (if there is no lecture, students must read before class; those that don't come under pressure from their team members since they cannot contribute during the quiz); presentation of the quiz (10-15 minutes) by the spokesperson of one of the teams (after each answer the other teams are polled for alternate answers and I explain the correct answer); consulting period (5 minutes) where I answer any questions remaining from the reading (I get very few questions); a discovery learning activity (30-40 minutes) designed to let student teams answer critical thinking questions about a model which illustrates the main concept(s)/process(es)/tool(s)/context(s) of the class period; and end-of-class processing (5 minutes) where each team prepares its written class report.

If students have never engaged in this type of learning before, the first couple of weeks are very interesting. Many students, especially good students, are convinced that they will never be able to learn this way. I have to encourage them to try it, to experiment a little. I usually do not record any grades for that two-week period. Students receive two daily team grades which are the same for all members of the team: 10 possible points for the quiz, and 10 for the team report (see above for a description of the latter).

At the end of the first two weeks, I have an activity where the students choose the weight they wish to assign to each aspect of the course. Then the teams bargain among themselves until the whole class can accept a common set of point assignments. This gives them ownership of their learning and convinces them that I was serious when I gave them control of the learning process. I have never had a class assign points in a way that I did not agree with.

By the fourth week, the teams are cooperating fully, and the students are convinced they are learning better. All of the teams have gone through three stages: forming the group, resolving conflicts, and learning to problem solve together. Time pressure for quizes and activities sometimes facilitates this team development, but it also raises the frustration level. Sometimes, I switch groups halfway through the course, but if I have assigned semester-long group projects, I keep the same groups all semester. After the switch, team building is much faster. When I do so, I switch the group membership to give the students experience working with a number of different people.

I always try for the greatest diversity in each group. Good students work with poor students, men with women, extroverts with introverts, etc. Since the team teaches each other about the course concepts, everyone learns by explaining their ideas to the others.

I collect the journals at least four times during the semester and assign a grade on how conscientiously they were completed. I learn a lot about how the groups are working, how each student is learning and what I am doing well or poorly from the student journals. The students are so accustomed to assessment that they are quite free with suggestions about my areas of improvement as well as my strengths and insights about my interactions with them.

I also schedule a mid-course assessment where I ask the teams to brainstorm and come up with better ways to organize the classes. I almost always get really good suggestions which I can implement to improve learning. In this mid-course assessment, I tell them that each class is divided into three sections: preprocessing (consisting of the quiz and team presentation), processing (consisting of a consulting session and learning activity), and postprocessing (end-of-class assessment time). Note the similarity between this structure and the recommended structure for a closed laboratory session. I ask them to revise this class organization plan, including revising the time allocated to each task, in such a way that it improves the learning atmosphere in the class.

One of the suggestions they have made which I have incorporated is to let the other teams suggest answers to the quiz questions before I give my answers. We do this one question at a time. First the spokesperson of the presenting team gives her answer. Then I quickly poll the other teams. Finally I clear up misunderstandings and we move to the next question. This has resulted in significant improvement in learning efficiency. I get to see what the entire class understood from the reading and only need to explain what was misunderstood.

Another suggestion, which I have been unable to incorporate, is to schedule a similar time for review of the learning activity at the end of class. Often the teams work at different speeds through this activity and time runs out before I can get team reports.

An advantage of this way of teaching is that one is free to try new approaches with the knowledge that there will be almost instant feedback. Some of the best ideas come from the students. I become a role model of a self grower for them since they see me always seeking to develop better processes.

Specific Course Experience

The four computer science courses I have taught using process education are:

1. Systems Analysis and Design using Whitten, Bentley & Barlow [8];
2. C and Assembly Language, a computer organization course using Scragg [7];
3. Data Base using Kroenke [5];
4. Simulation using SLAM II by Pritsker [6].

All of these are project-oriented and to a certain extent lab-centered courses. They are listed in the order I taught them using the PE approach.

The most successful of the four was the Systems Analysis and Design course. The students were able to read and understand the entire 850 page text [8], and complete a semester long project during which they worked with real clients, developing specifications, performing an analysis of the current system with entity relationship and data flow diagrams, designing a new system, and implementing a prototype of some portions of the system. They worked in three person teams, meeting a sequence of 10 milestones and writing a fairly professional report by the end.

When I have taught this course in the past, I have found myself and the students bogged down in the sea of terms and tools. Making the students responsible for reading the text and experimenting with the software (we used Excelerator primarily) freed me up to explain what they did not understand and to prepare learning activities which gave them a real working knowledge of the concepts. My assessment is that learning was significantly improved and I was able to cover more material than in a traditional course. Sacrificing content for process is a frequent criticism of process education. The students and I were able to refute that claim.

The second course I taught using PE was one in which I had to teach languages (C and Assembly Language). How was I to encourage students to "discover" the syntax and semantics of two new languages? All the students had studied CS1 using Pascal (without objects) and some had taken CS2 using object-oriented Pascal. I was confident in their ability to design the solution to a problem and to write good user documentation, but I wanted to review these processes as well.

After consultation with Dan Apple, I decided to use the process of reengineering to teach these languages. I prepared a set of well written but poorly documented programs in C. The students worked in four-person teams and each team was assigned a different program to run, improve the documentation, and rewrite in Pascal. As each team finished its program, I rotated that team's better documented C program to another team until all three teams had seen and translated all the programs. By this time the students had a good understanding of C and were ready to do the first

programming assignment also in teams. After that, each student was required to write her own programs.

I repeated this process when we got to assembly language, although this time the teams reengineered the assembly language programs into C. Otherwise, the class organization was similar to that described in section 2 above. I was not able to get as far in the course as I had hoped. This was the first semester I had tried to teach two new languages and I doubt if I would have succeeded as well using traditional methods. Next year, the students taking this computer organization course will have studied CS1 and CS2 under the object oriented C++ paradigm. I will have to introduce them to a functional paradigm when I have them use C. It will be interesting to see how readily these students make the reverse paradigm shift.

The course in Data Base was similar to the one in Systems Analysis and Design, except that the projects were more contained, textbook style. Many of the students took both courses. For some, it was the third or fourth course taught using process education. I began to get some rebellion against keeping a journal. One student reflected that she spent a half hour after each class "thinking of flowery phrases to relate what I have done. I do the same thing every time." I have experimented with different journal styles from free floating to answering a set of specific questions. I find that the most productive format for the students is for them to identify one strength, one area for improvement and one insight for their own individual work, the team's work, the facilitator's (myself) contribution, and that of the learning activity. I also have them write down 3 things they learned during the class and a process and skill that they have practiced. The purpose of the journal is to help students reflect on the learning process and not just on the concepts learned.

The final course, Simulation, is one I am currently teaching. It is the most mathematically oriented of the four and has the most challenging concepts. I always have trouble teaching the course, but using process education has proved as successful as any other approach. The students stay alert throughout each class and wrestle with the concepts under my guidance. Some of the activities I have planned have worked well and some have been too difficult. Students in the course learn to write FORTRAN programs as well as how to use SLAMSYSTEM, a simulation modeling environment.

I introduced a two hour closed lab in the Simulation course this semester and it has been very helpful in allowing pairs of students to design, code and run simulation problems under supervision. In past semesters students have presented some of the examples from the book during class, but working on their own problems was relegated to homework projects, requiring many hours in my office as they worked through difficulties. This semester, the practice from lab has helped the students become more independent while completing their projects.

Role of the Teacher

It has been quite an effort to make the switch to process education. Some teachers have done so gradually, but I made the transition cold-turkey. The first class I tried it in was Finite Mathematics and it was a disaster, primarily because I did not understand well enough the interactions of all the roles I needed to play. After attending two more teaching institutes, I have had significant success for the past two years, as indicated in the preceding section. My teaching evaluations have reached

an all-time high, and students returning from interviews relate that most of the interview was devoted to their experiences in my courses. I believe that students, particularly the weaker ones, are learning more and gaining greater confidence in their ability to learn.

All this success is not without its price, however. I have spent long hours preparing quality learning activities, grading quizes, activities, journals, as well as the usual tests, projects, homework assignments, etc. Fortunately, as I get more practice with the methodology, I have to spend less time in preparation. I am hopeful that, with WWW access improving, repositories of successful learning activities for a variety of courses will become available. Perhaps, as textbooks are published on-line, the process education adaptations for courses using these books will be integrated into the text.

Let me describe the role of the teacher in the classroom during a process education-oriented class. For one accustomed to performing as a lecturer while students took notes and asked questions, it was quite a change for me to take on the roles of leader, assessor, facilitator, and evaluator real time in the classroom. This division of roles and the following description is due to David Hanson from the Chemistry Department at SUNY Stony Brook, and Daniel Apple from Pacific Crest Software [4, 10].

"As *leader*, the instructor develops and explains the lesson, defines the objectives (both academic and process skills objectives ...), criteria for success, expected behaviors, and establishes the organization [classroom management structure...].

"As *monitor/assessor*, the instructor circulates through the class to monitor and assess individual team performance and to acquire information on student understanding, misconceptions, and difficulties in collaboration.

"As *facilitator*, the instructor intervenes and asks timely critical thinking questions to help groups understand how they are functioning, why they may be having difficulty, and what they need to do to improve and make progress. By combining monitoring, assessing and facilitating, the instructor assures that all understand the assignment, that each group member is fulfilling their assigned role, that positive verbal exchanges are occurring, and that progress is being made. Such intervention provides [realtime] feedback, motivation, and reinforcement; teaches academic and collaborative skills; and guides students in the use of a problem-solving methodology.

"As *evaluator*, the instructor provides closure to the lesson by asking group members to report answers, summarize the major points, and explain the strategies, actions, and results of the group. the evaluator also provides evaluations to individuals and groups regarding performance, achievement, and effectiveness and shares general points with the class." [4, 10]

Conclusion

While the role of a PE teacher seems somewhat overwhelming, one can grow into it. An important aspect of process education for the student is that learning is fun. Facilitating process education should also be fun. After the initial shock, students appreciate the opportunity to learn this way. Constant feedback helps both student and teacher perform better. Process education requires that a teacher take risks, but the results are significant. All the students improve their learning process, not just the better students.

Not only do students develop learning skills, they have an advantage when it comes to finding a job. Employers seek individuals who excel as: 1) Quick Learners, 2) Critical Thinkers, 3) Problem Solvers, 4) Communicators, 5) Professionals Knowledgeable in Their Field, 6) Team Players, 7) Self Starters, and 8) Creative Thinkers. [3, vii] These skills are the ones practiced while experiencing process education, and job recruiters compete for students with these skills.

In summary, process education seems a natural for teaching computer science because CS students have the potential to move through all the stages of learning rather quickly. The closed lab component of many computer science courses already utilizes some of the PE processes. Computer science faculty are used to taking risks since the discipline is in such a state of flux. In my experience the change to process education is a risk well worth taking.

REFERENCES

1. D. K. Apple and W. Duncan-Hewitt, A Primer for Process Education, Pacific Crest Software, Corvallis, OR, 1995.

2. D. K. Apple et al., Foundations of Learning, Pacific Crest Software, Corvallis, OR, 1995.

3. D. K. Apple, S. W. Beyerlein, M. A. Schlesinger, Learning Through Problem Solving, Pacific Crest Software, Corvallis, OR, 1992.

4. D. M. Hansen and D. K. Apple, Process - The Missing Element, Pacific Crest Software, Corvallis, OR, 1995.

5. D. M. Kroenke, Database Processing, Macmillan, New York, 1992.

6. A. A. B. Pritsker, Introduction to Simulation and SLAM II, Systems Publishing Corporation, West Lafayette, IN, 1995.

7. G. W. Scragg, Computer Organization: A Top-Down Approach, McGraw Hill, 1992.

8. J. L. Whitten, L. D. Bentley, V. M. Barlow, Systems Analysis & Design Methods, Irwin, Burr Ridge, IL, 1994.

Appendix A

Each class will have group exercises. Teams should rotate the following roles so that each member gains experience in each role.

Team Captain

- Keeps the group on task and makes sure everyone is having fun;
- Ensures that the group accomplishes the task within the allotted time;
- Encourages full participation by each group member;
- Ensures that all team members can articulate what has been learned;
- Ensures that the other group members perform within their roles;
- Represents the group in all interactions with the instructor.

Recorder

- Records group roles and instructions at beginning of activity;
- Takes notes of important points which come up during the activity;
- Ensures her words accurately reflect group consensus. Checks wording with the group when necessary;
- Gives the group report orally at the end of the activity unless the instructor or team leader indicates otherwise;
- Prepares a written report of the group's decisions and discoveries during each activity.

Reflector

- Watches group process: what is going well, what is needs improvement, what can be done to improve the process (use constructive criticism);
- Reports her observations to the group when needed (at least once every 15 minutes) to help make the work go forward and help the group to function better. The report should contain: (1) the group's most important strength since the last report; (2) what skill the group most needs to improve on; and (3) an insight into how group learning can be improved. These reports should be written in the reflector's journal and time stamped;
- Prepares a written assessment of group process during the class or lab and checks it out with the group during the end-of-class assessment period. This will include:
  - How well the group performed as a team and how well each member performed her individual role;
  - two greatest strengths, two areas most in need of improvement, and the major insight gained from group's activity during the class;
- Reminds the team leader of her duties if necessary.

Spokesperson

- Represents viewpoints held by a majority of the team members.
- Retrieves information from various sources (computer, text, manuals...).
- Encourages risk-taking and critical thinking.
- Delivers required oral reports about the activity.

Note that all group members must fully participate in the learning exercise while performing their roles. All must really want the team to succeed.

PERFORMANCE CRITERIA FOR GROUP ROLES

Team Captain

1. Keep the process enjoyable and rewarding;
2. Keep all team members performing within roles;
3. Keep the team focussed;
4. Keep all team members involved in the problem-solving process;
5. Ensure that all team members can articulate what has been learned;
6. Control the process: keep it systematic;
7. Strengthen the weakest link;
8. Time management;
9. Stress management;
10. Active learner and contributor;
11. Overall team performance;
12. Plan time for various tasks;
13. Set up meeting times and places, meeting length, deadlines;
14. Act as the objective internal mediator when interpersonal conflicts arise;

Recorder

1. Record names and group roles at beginning of class;
2. Record instructions at beginning of task;
3. Quality of listening and recording skills;
4. Legibly document the process, group decisions, and discoveries in the group Learning Journal;
5. Active learner and contributor;
6. Ability to control information flow;
7. Ability to rearticulate concepts in alternative forms;
8. Ability to integrate and synthesize multiple ideas;
9. Ability to diagram and draw pictures;
10. Create and communicate algorithms;
11. Prepare the report for handing in at end of class;

Reflector

1. Ability to rephrase or reframe observations into constructive criticism;
2. Observation skills;
3. Report strength, area for improvement, and insight in the Reflector's Journal and verbally to the group at least once every 15 minutes;
4. Provide information about group interactions;
5. Provide information about the group process;
6. Active learner and contributor;
7. Intervene with observations about the process and strategies for change;
8. Remind team leader of duties;
9. Acquire sufficient evidence of behaviors and documentation to permit fair judgements to be made in the event of mediation and conflict resolution.

Spokesperson

1. Listening and communication skills;
2. Observation skills;
3. Experimental skills;
4. Retrieving information from various sources;
5. Active learner and contributor;
6. Planning and management skills;
7. Critical thinking;
8. Collaborating;
9. Synthesizing;
10. Risk taking;
11. Computer skills;
12. Giving oral reports;

The Paperless Writing Course: A Relevant Business Writing Course

Michelle Snyder
Lord Fairfax Community College
P.O. 47 Middletown, VA 22645
(540) 465-3731 ext. 165
michells@judds.com

Abstract

In the age when the paperless office is fast becoming a reality, the need for a paperless writing course has arisen. This paper will present an easy and inexpensive way to design a paperless writing course by taking advantage of the annotation feature available on many word processors, such as Microsoft Word or Lotus Ami Pro. This feature allows users to insert messages or comments into a document. The ideas presented have been classroom tested and proved effective in allowing the instructor and student greater flexibility in creating and meeting assignment deadlines and promoting better, more efficient communication flow between student and teacher.

Introduction

The praises of the paperless office are so often sung that it seems that its virtues might also transfer well into a more academic setting. While many offices and even a few Universities, such as University of Delaware, have done away with their forms and multiple copies and become essentially paperless, the manner in which writing is primarily taught has changed little. Writing students still do much of their in-class compositions with paper and pencil, and are usually encouraged to use a word processor only when completing a major assignment, such as a term paper or long essay. Due to the rapid growth of information technology, English composition course textbooks often teach old-fashioned methods of researching, writing, and taking notes.

This paper will outline a simple, inexpensive, yet effective, means of implementing a paperless writing course. Only a stand- alone PC, Microsoft Windows, and either Lotus Ami Pro or Microsoft Word are needed. A networked system can be used, and if the instructor desires, files can be transferred electronically between instructor and student. However, for the class outlined below this was not feasible, due to the need for the course to be portable enough to be offered at three different locations.

"The Paperless Writing Class" is a class offered in a large printing facility by a workplace education project, jointly funded by a federal grant and three printing companies. Courses offered by the project are designed to teach print employees the fundamentals of workplace communication and math, as well as help them upgrade the skills they already possess in an increasingly technologically advanced work environment.

A workplace writing course seemed to provide the perfect laboratory setting for the paperless writing

experiment for several reasons. First the students are constantly in need of learning to use the computer or at least upgrade their skills. Second, most business professionals already do most of their composing at the computer, so to make them revert to paper and pencil appears to be an unnecessary step backwards. Third, the student is able to make corrections quickly and painlessly without having to recopy the entire document. Finally, this arrangement allows student/teacher flexibility in arranging meeting times. For example, the student may pick up the annotated disk before the next class meeting, and make any necessary corrections in order to meet work deadlines.

The students were excited about the idea of a paperless writing course, as this would allow them to upgrade both their writing skills and their computer skills at the same time. Many of the students had been wanting to upgrade their computer skills, but did not have time to take a word processing course. However, some of the students were not computer-literate and were somewhat intimidated by the idea of taking a course that involved computers. Yet, because the computer was not the single focus in "The Paperless Writing Course", they were less anxious than they would have been taking a computer literacy course.

The opportunity to teach students two highly valuable skills concurrently, not to mention the thought of avoiding writer's cramp from so much editing by hand, was enough to satisfy the writing instructor. Although courses involving the use of the computer generally require more preparation, the ability to provide students with the technical skills necessary to improve their job performance justifies the extra time commitment on the part of the instructor.

Methodology

The annotation feature, rather than the revision tracking feature, was used for this course. The revision tracking feature was designed to allow a user to track changes made to a document. This would allow an instructor to revise a student's document, and would allow the student to view the revisions that the instructor had made. However, it would not ensure that the student understands why the corrections were made, and would not require him or her to think critically, and to learn from his or her mistakes.

Instead of using the revision tracking feature to revise student documents, the instructor decided to use the annotation feature available in Microsoft Word and Lotus Ami Pro to direct the student's attention to an error to be corrected, and allow the student to correct the error him or herself. Through use of the annotation feature, an instructor's noting that an error occurred would force the student to pinpoint the error, understand a particular grammar rule, and, most importantly, use the rule. This would reinforce the student's knowledge of the English language and, perhaps more importantly, would require him or her to think. To ensure that the students were indeed displaying and reading the annotations, they were required to submit a corrected copy of the document to the instructor.

Lotus Ami Pro's Annotation Feature

The annotation feature allows one or more users to insert
messages or comments into a document. Subsequently, the notes can be read, revised, or removed by any other person who displays or prints the document. To insert a note into a Lotus Ami Pro

document text, a table, a header, a footer, or a footnote the user will perform the following steps:

- Place the insertion point where the annotation is to be inserted.
- Choose "Edit/Insert" from the menu bar and choose "Note", or click the "Insert" icon and type the text.
- Type the note text.
- To return to the main document text, press the "Esc" key.

To display a note to read or edit its contents, simply double- click the note mark in the text. A note can be edited by displaying the note and editing it by inserting, deleting, cutting, copying, or typing the desired text. Finally, a note can be removed individually with or without being displayed, and all notes in a document can be removed simultaneously.

To remove a note without displaying the Note window, place the insertion point on the desired note mark and press "Delete". A displayed note can be removed by accessing the Control menu box in the Note window and choosing "Remove This Note". Finally, all notes in a given document can be removed by accessing the Control menu box in the Note window and choosing "Remove All Notes".

Ami Pro allows users to print Notes by performing the following steps:

- Choose "File/Print" from the Menu bar.
- Select "Options".
- Choose "With notes"
- Select "OK" to return to the Print dialog box.
- Choose "OK" again to print the document with notes.

Ami Pro prints the number of each note in square brackets in the location in the text where the note exists. On separate pages after the last page in the document, Ami Pro prints the number, initials, and contents of each note using the font specified in the current body text paragraph style for the notes.

Microsoft Word's Annotation Feature

Microsoft Word's annotation feature has a user interface that is slightly different from that of Ami Pro. One of the main differences is that while in Ami Pro the annotations appear as tiny, brightly-colored flags, in Word annotations appear as rather dull sets of brackets containing the reviewer's initials. However, like the annotation feature in Ami Pro, Word allows one or more users to insert messages or comments into a document. The notes can then be read, revised, or removed by any other person who displays or prints the document. To insert a note into a Microsoft Word document text, a table, a header, a footer, or a footnote perform the following steps:

- Select the desired text or item, or position the insertion point at the end of the desired text or item.
- From the Insert menu, select "Annotation".
- Type the annotation text in the annotation pane, and choose the "Close" button, or to keep the annotation pane open to add additional comments, click in the document window, and repeat the above steps.

To read or edit annotations in Microsoft Word, the user can either choose "Annotations" from the View menu, or double-click on an annotation mark in the document window. To see the annotation marks in Word, the user must click the Show/Hide paragraph markings in the Standard toolbar. Annotations can be deleted by selecting the annotation mark in the document window and pressing either the "Backspace" or "Delete" key.

Microsoft Word allows the user to print annotations with or without the document.

To print the document with the annotations:

- From the File menu, choose "Print".
- In the "Print What" box, select annotations.
- Choose the OK button.

To print a document with annotations:

- From the File menu, choose "Print".
- Choose the "Options" button.
- Under "Include With Document", select the "Annotations" check box.
- Choose the OK button.
- In the Print dialog box, choose the OK button.

Both of the Lotus Ami Pro and Microsoft Word annotation features allow voice annotations to be inserted; however, because most of the students' computers were not equipped with a sound board, the use of voice annotations was not feasible for this class.

The Experiment

We began the course by reviewing the basics of using the word processor to create, save, edit, and print a document. Then we discussed the use of the Menu bar, the Toolbar, and shortcut keys to perform such tasks as cutting, pasting, and formatting text. (Many other features, such as the spelling-checker and the thesaurus were discussed during the subsequent sessions.). Afterwards, we discussed the annotation feature in Ami Pro, its purpose for this class, and how to insert, display, edit, remove, and print the notes.

The instructor lectured on some aspect of writing for the first half of each scheduled class meeting. The latter half of the class period was used to teach the students how to use certain features of the word processor that supported the lecture given during the beginning portion of the class. Then a follow-up homework assignment to emphasize the concept was be given. For example, if the lecture highlighted stylistic issues such as the importance of word choice and semantics, the use of the thesaurus was demonstrated. Then, for their homework assignment, the students were asked to take a simple narrative and rewrite it to make as complex and incomprehensible as possible, using the thesaurus to help them accomplish this task. This assignment helped the students to discover underlying semantic properties of words that, at least on the surface, appear to mean the same thing, and it drove home the importance of clarity and word choice in writing.

The students completed the homework assignments and turned them in to the instructor on floppy disks. The instructor then reviewed the students' writings, annotating any errors, and then returned the annotated disks to the students. It did not take long for the students to grow accustomed to reading the annotations or notes in Ami Pro. The notes appear as tiny colored boxes with the editor's initials adjacent that the user simply selects with a mouse click to open. The student then reads the note, which should be placed strategically close to the error. The challenge for the student is to recall the grammar rule or writing concept and correct the error, which is precisely the goal of writing instruction: to enable the student to comprehend, remember, and use the rules of a language to produce clear and concise writing.

Because relevancy to the workplace setting is a key element of a successful workplace education program, many of the homework assignments were directly related to the students' jobs. Because of this, the flexibility of the instructor in reviewing the students' homework assignments was essential. If a student submitted an assignment that had a real-world deadline, he or she could communicate this to the instructor, and the instructor and student could arrange a time when the student could pick up the annotated disk in order to meet his or her external deadline. Several students regularly turned in assignments, such as instruction manuals, memos, minutes, and letters, that had real- world deadlines that occurred before the next class meeting. In all cases, the instructor was able to annotate the documents and return them to the students to allow them to make the necessary corrections, so that they could meet their external deadline. These students all expressed how much they appreciated the opportunity to learn and accomplish work that was relevant to their jobs at the same time.

The student comments made during class and the instructor and class evaluations showed that "The Paperless Writing Course" briefly outlined above was successful in meeting the goals of the students, the goals of their managers, and the goals of the workplace education project. "The Paperless Writing Course" enabled the employees to improve their basic workplace writing skills and allowed them to upgrade their computer skills using the work processor available on their own desktop. These upgraded skills were appreciated by the employees managers, who will benefit from having better-trained and more highly-skilled employees. The workplace education project staff was pleased to be able to offer a class which helped them achieve their mission, which is "to deliver workplace education programs to print industry employees ... [that] will enhance the personal and professional development of the partners' workforce and instill a desire in the employees for lifelong learning."

Future Directions

Undoubtedly, using annotations for editing purposes is not a brand new idea, but one can take the concept a step further by automating some of the responses to common errors that students make. One way of doing this is to use Microsoft WordBasic and a custom dialogue box that contains controls to help annotate errors by allowing the user to select from a list of commonly used corrections. For example, a list of corrections might include such commonly committed errors as: subject-verb agreement, parallel construction, misplaced modifier, and pronoun reference. All of this can be packaged as an Add-in and loaded automatically from the Windows Program Manager screen for user convenience. The dialogue box can be accessed from a command button on a toolbar, a shortcut key, and/or as a menu option.

The use of a custom dialog box containing controls allows instructors to customize Microsoft Word's annotation feature and automate error responses, thus alleviating some of the tediousness and redundancy of correcting papers. The list of error responses can continuously be added to and updated, whenever a new class of errors has been discovered, therefore eliminating the need for an exhaustive list of possible errors at the beginning. Using a dialog box to automate error responses in no way limits instructors to a closed set of error responses, but rather allows them to avoid retyping responses to the same classes of errors over and over again, while still giving them the flexibility to enter creative, one-time responses to point out an uncommon error or to praise a student's brilliant writing.

Another custom feature that would make the system more useful to the instructor would be to create a log of students and to have the ability to track the number of annotations or corrections in each document submitted by a student. This would allow the instructor to quantitatively assess a student's progress, depending on the course design and nature of the assignments. In addition, the nature of the annotations or corrections could be tracked and used by the instructor to help the student pinpoint and strengthen his or her weak areas.

By their very nature, courses that involve the computer typically require considerably more time for preparation, while writing courses typically require more time for homework correction. Automating the error responses by using a custom dialog box containing controls as outlined above will allow the instructor of a course composed of a marriage of computers and writing to avoid some of the more tedious and redundant aspects of correcting student documents. This will free the instructor to expend more creative energy on course preparation, rather than being bogged down with repetitive keystrokes.

References

Lotus Ami Pro User's Guide. (1993). Lotus Corporation.

Microsoft Word Developer's Kit. (1994). Microsoft Press: Redmond, Washington.

Microsoft Word User's Guide. (1993). Microsoft Corporation: Redmond, Washington.

Neural Networks for the Beginner

Robin M. Snyder
Associate Professor of Computer Science
Byrd School of Business
Shenandoah University
Winchester, VA
(540) 665-4938
rsnyder@su.edu

Abstract

Artificial neural networks are an increasingly important problem solving tool that have been applied to practical problems in many disciplines. This talk will provide a nontechnical introduction to neural networks: the problems for which they can be used with success, the types of problems for which they are ill-suited, and how to get started in neural networks. And, since neural networks are trained and not programmed, it is possible for the non- programmer to use neural network technology to advantage. Guidelines for integrating the topic into the curriculum and pointers to the literature will be provided.

Artificial Intelligence

AI (artificial intelligence) is the search for ways to make machines, more precisely, computers, more intelligent. A better name might have been machine intelligence. The paradox of artificial intelligence is that once something (that appears intelligent) is understood, it is no longer considered intelligent. Some areas of artificial intelligence include (traditional rule-based) expert systems, fuzzy systems, neural networks, and combinations of these such as fuzzy-neural-expert systems.

Expert Systems

Expert systems are a left-brained approach to AI that makes use of facts and rules in a systematic logical manner in order to arrive at conclusions that mimic experts in a field, allowing novices to perform more like experts in handling discipline- specific problems (i.e., the experts are still needed). Practical applications include tax preparation, grammar checkers, legal advice, help desks, and medical diagnosis.

Expert systems require a precise set of rules. Forget a rule, and your expert system may bomb. One of the early expert systems for providing user help responded to a user question

"How do I get more disk space?"

with the answer

"Use the command erase *.*.".

Oops. A rule was forgotten. In practice, expert systems are developed until they prove sufficiently useful.

Fuzzy Systems

Fuzzy systems, derived from fuzzy, or multivalent, logic, as opposed to crisp, or two-valued logic, are used primarily for process control applications. As a simple example, consider maintaining the water from a faucet at a constant temperature. If it gets a litte too hot, turn the control knob a little to make it cooler. If it gets a little too cold, turn the control knob a little to make it warmer. If it is very hot, turn the control knob more than if it is just a little hot. And so on. Fuzzy rules provide a convenient way to make decisions in the face of many potentially conflicting sources of information. Applications of fuzzy logic include automatic camera focusing, driving high speed rail systems, smart washing machines and vacuum cleaners, and fuzzy database queries.

Neural Networks

Motivated by the brain, neural networks are a right-brained approach to artificial intelligence that is used to recognize patterns based on previous training. Practical applications include adaptive noise canceling, mortgage risk evaluation, bomb sniffing, word recognition, forecasting, and handwriting analysis.

The field of neural networks is sometimes called artificial neural networks to separate it from human brain neural networks. For the purposes of the present discussion, neural networks will mean artificial neural networks that are used to solve pattern recognition problems.

A neuron is the simplest processing element of a neural network. Neurons are connected (and communicate) by means of synapses. When a neuron receives sufficient stimuli (e.g., from other neurons), it fires. That is, the neuron either fires or does not fire, which can cause other neurons to fire or not fire. And so on. Neurons and synapses can be combined into neural network models that can be used to solve pattern recognition problems.

Neural networks are not programmed. They are trained. Of course, good judgment is needed to properly set up and perform the training exercises. Consider the training of a vision system to recognize tanks. It has been said that the army took pictures of a tank from various positions, set up the neural network and trained it. During evaluation, the neural network performed poorly. It was eventually discovered that the pictures were of the same tank and that a beer can was sitting on the front side of the tank. The neural network trained itself to identify a tank by the beer can sitting on the tank. Of course, during performance evaluation, the tanks did not have the beer can in the right place and were, appropriately not recognized as tanks. In this case, the neural network was evidencing intelligent behavior, but was improperly trained.

In a classroom setting, students sometimes key in on the wrong ideas, usually based on an incomplete representative sample, and, come test time, make mistakes based on that training.

In practice, one would not program an expert system to recognize a pattern and one would not train a neural network to make decisions from rules. But one could combine the best features of each in solving a problem.

Three Layer Model

One of the simplest and most common neural network model is the fully connected three layer model that is trained using the backpropagation algorithm. The layers consist of the input layer (sometimes not counted as a layer, in which case this is the two layer model), the hidden layer, and the output layer.

- The input layer consists of a number of neurons that take input from the outside world. It is best to process and/or otherwise scale this information into a form that is easy for the computer to handle.

- Each neuron in the hidden layer (there can be more than one hidden layer) has a connection from each neuron in the input layer. By a suitable combination of these inputs, each neuron in the hidden layer either fires or does not fire. The results are sent to the output layer.

- Each neuron in the output layer has a connection from each neuron in the hidden layer. By a suitable combination of these inputs, each neuron in the output layer either fires or does not fire. The results are processed into an appropriate form that is easy for a human to handle.

Instead of programming a neural network, the neural network is trained by presenting a history of inputs and outputs to the network. The neural network adapts by adjusting errors that determine when individual neurons fire. Thus, after a neural network is suitably trained, the test comes when the neural network is presented with a pattern that may or may not be in the training set. The neural network will then attempt to correctly identify the pattern, even in the presence of missing or incomplete data.

The backpropagation algorithm uses a gradient descent method, which means that a representative error term is minimized in the direction that minimizes the error. Somewhat like trying to minimize your elevation by walking downhill. The problem is that one may get stuck in a local minimum and not find the desired global minimum. Methods have been developed to attempt to get around this problem.

Training can be difficult and time-consuming. But, after training, the neural network can quickly recognize patterns.

There are many other methods that have been developed for special cases of learning. For example, the backpropagation method is an example of supervised learning. Other methods are adaptive in that they work (for special cases) for unsupervised learning.

Although the concept of neural networks seems simple, in practice, subtle nuances can affect the ability to train and use a neural network. However, such nuances are beyond the scope of the paper.

Integration into the Curriculum

One of the easiest places in which to integrate neural networks into the curriculum is as a follow-on to the study of regression.

The goal of regression is to determine a functional relationship between a dependent variable and one or more independent variables. This is done by hypothesizing a functional relationship and then using a regression software package to determine the best fit for that particular regression model.

A typical regression problem might be, "What is the relationship between TV screen size (the independent variable), measured diagonally, and TV cost (the dependent variable)?". A more involved regression problem might be, "How is the price (the dependent variable) of a computer dependent on the amount of RAM, processor speed, disk drive size, etc. (the independent variables) of a computer.

The key point is that in regression models, the user must hypothesize a specific model and then run the software package on the data. And it can be difficult to handle incomplete or missing data points.

Once a functional relationship is determined, the forecast can be made by supplying independent variables that are used to determine the prediction for the dependent variable.

By contrast, a (simple backpropagation) neural network model is presented with the (scaled) independent data as input and the (scaled) dependent data as output, and trained until it can sufficiently predict the output data given the input data. The network is then presented with input data that it has not seen and then calculates a predicted value as an output value. Only a few decisions need to be made, such as how many hidden levels to use, how many nodes to use at each level to use, cutoff points, momentum factors, etc.

Software

Neural network software is becoming more available and more affordable. High performance neural network software is still quite expensive. The author has written a neural network software package that uses the backpropagation method. It is text-based in that the use writes a program as text that specifies the layers, connections, training data, etc.

Annotated Bibliography

As there is so much literature available on neural networks, and the amount of available information is increasing at an even faster rate, this section provides a short annotated bibliography of some references that the author has found useful for one purpose or another in understanding and/or implementing neural networks.

- Naturally intelligent systems (Caudill, 1990, 304 pages) is a very well written, readable, and entertaining account of neural network history and technology, without equations, derivations, or involved proofs. Many examples are presented in order to give intuitive meaning to concepts in the field of neural networks.

- Building neural networks (Skapura, 1996, 286 pages) is an invaluable resource for learning how to apply neural networks in practice. Many other books cover derivations and proofs that are not particularly useful to the person who just wants to apply neural techniques using existing software. A sampling of chapter topics include application design, business and

existing software. A sampling of chapter topics include application design, business and financial applications, pattern classification, image processing, process control and robotics, and fuzzy neural systems.

- A practical guide to neural nets (Nelson, 1991, 344 pages) is a good nontechnical introduction to neural networks. Many practical applications are discussed.

- Neural computing: theory and practice (Wasserman, 1989, 230 pages), although somewhat dated, provides a good technical background to standard methods in the field without too much in the way of derivations and proofs. A computer scientist or software engineer should be able to implement many of the algorithms from the descriptions provided.

- Neural networks in computer intelligence (Fu, 1994, 460 pages) is a very thorough and readable overview, although grammatically somewhat boring, of the entire field of neural networks with many examples and variations of the neural network model. A sampling of chapter topics include knowledge-based neural networks, incremental learning, mathematical modeling, complex domains, discovery, structures and sequences, learning spatiotemporal patterns, expert systems, casual learning and modeling, validation and verification, rule generation from neural networks, learning grammars, and case studies that include genetic pattern recognition, drug discovery, and flow cytometric analysis of leukemia. More importantly, there are extensive references into the literature for each of these areas.

- Neural networks and fuzzy systems (Kosko, 1992, 449 pages) is a book written by an engineer for engineers. It is very technical and complete, and not very accessible to the layperson. However, Kosko does intersperse the technical details with discussions that involve pertinent philosophical issues of fuzzy and neural systems. For example, citing references in the literature, he concludes that there is nothing new about the backpropagation algorithm. *The algorithm did not offer a new kind of learning. Instead it offered only a new and computationally efficient way to implement an estimation method that statisticians had long explored* (Kosko, 1992, p. 198), stochastic approximation as used by statisticians in the 1950's. The author found his neural, fuzzy, and fuzzy-neural truck backer-upper systems interesting.

- Neural network computing (Bharath, 1994, 187 pages) is a somewhat simplistic, but yet useful introduction to neural networks. In particular, the comparison of neural networks with multivariate statistical techniques (eigenvalues, principal components, etc.) is very interesting.

- Introduction to the theory of neural computation (Hertz, 1991, 327 pages) is an excellent introduction to the theory of neural computation. Equations, derivations, and proofs are provided, as are many references into the literature. Comparisons are made with multivariate statistical techniques. Although thorough and well written, the technical presentation may be difficult for the casual reader.

- Neurocomputing: foundations of research (Anderson, 1988, 729 pages) provides a collection

of reprints of many of the important research papers in neural computing, from the 1890 article "Association" by William James, and the classic 1943 article by McCulloch and Pitts, through the mid 1980's. Each article is preceded by an introduction putting the reprinted article in perspective.

- The artificial intelligence debate: false starts, real foundations (Graubard, 1988, 311 pages) provides a number of well-written and very readable articles that discuss and debate the various viewpoints of artificial intelligence, primarily in terms of connectionist models and neural networks.

This collection of references is not complete by any sense of the imagination. There are many other good references that the author is either not aware of or has not had the opportunity to review.

History

The history of neural networks is somewhat interesting. Research on neural networks began in 1943 (Anderson, 1988) and continued until the late 1960's. In 1969, publication of the book Perceptrons: an introduction to computational geometry .by Minsky and Papert (Minsky, 1969), proved that there were certain problems that perceptrons, a simple version of a neural network, could not solve. This led to limited funding of the area, and thus restricted research in the area of neural networks. In the late 1980's, the backpropagation algorithm was discovered and became popular in that it avoided the restrictions of the earlier perceptron networks. Increased attention to the area eventually revealed that the roots of backpropagation could be traced to the early 1980's, then to the early 1970's, and, finally, to certain statistical techniques of the 1950's (Kosko, 1992, pp. 196-199).

Kolmogorov, a Soviet mathematician, proved a theorem in information theory in the 1950's that has consequences in neural networks (Caudill, 1990, p. 174-177). In simple terms, Kolmogorov's theorem (as shown by Hecht) shows that any function mapping of m input numbers, each a real number between 0.0 and 1.0, that is to produce n output numbers, each a real number, can be exactly implemented by a neural network with three layers where the input layer has m input neurons, the hidden layer has 2*m+1 neurons, the output layer has n output neurons, and each layer is fully interconnected to the adjacent layer. That is the good news. The bad news is that the proof is not constructive. It only says that it can be done. It gives no indication of how to do it, or whether a simpler network could solve the same problem. However, it does show that a solution to a given problem may be within the realm of possibility.

And, there continues to be feuds between groups who claim that neural networks should model the brain and groups who claim that even though neural networks are not a strict model of the brain, they can be used to solve problems of interest. Both viewpoints have merit.

But, from a problem solving point of view, however, neural networks offer one more tool with which to solve problems.

Summary

In summary, if there is no obvious solution to a problem, then various intelligent systems approaches

can be used. If the problem involves some kind of pattern recognition, neural networks may provide a possible solution. If the problem involves some kind of process control, a fuzzy system may provide a possible solution. If there are facts and rules that can adequately describe the system, a traditional expert system may provide a possible solution. And, if the problem involves all of these and more, perhaps a fuzzy-neural-expert system may provide a possible solution.

References

Anderson, J., & Rosenfeld, E. (eds.). (1988). Neurocomputing: foundations of research. Cambridge, MA: The MIT Press.

Bharath, R., & Drosen, J. (1994). Neural network computing. New York: Windcrest/McGraw-Hill.

Caudill, M., & Butler, C. (1991). Naturally intelligent systems. Cambridge, MA: The MIT Press.

Fu, L. (1994). Neural networks in computer intelligence. New York: McGraw-Hill.

Graubard, S. (ed.). (1988). The artificial intelligence debate: false starts, real foundations. Cambridge, MA: The MIT Press.

Hertz, J., Anders, K., & Palmer, R. (1991). Introduction to the theory of neural computation. Reading, MA: Addison-Wesley.

Kosko, B. (1992). Neural networks and fuzzy systems. Englewood Cliffs, NJ: Prentice-Hall.

Minsky, M., & Papert, S. (1969). Perceptrons: an introduction to computational geometry. Cambridge, MA: The MIT Press.

Nelson, M., Illingworth, W. (1991). A practical guide to neural nets. Reading, MA: Addison-Wesley.

Skapura, D. (1996). Building neural networks. Reading, MA: Addison-Wesley.

Wasserman, P. (1989). Neural computing: theory and practice. New York: Van Nostrand Reinhold.

A Personal Multimedia System for Instructional Support

Robin M. Snyder
Associate Professor of Computer Science
Byrd School of Business
Shenandoah University
Winchester, VA
(540) 665-4938
rsnyder@su.edu

Abstract

How can one get started with multimedia in the classroom for instructional support? Someone without a large budget. Someone without a lot of time. This paper will present a specific bottom-up implementation method for getting started at the personal level. The cost-effective techniques will be used for the presentation itself. Ideas for class presentations and assignments are included.

Multimedia

There are many definitions of multimedia. One of the best and most widely accepted is Hofstetter's definition.

- Multimedia is the use of a computer to present and combine text, graphics, audio, and video with links and tools that let the user navigate, interact, create, and communicate. (Hofstetter, 1995)

From the definition, the following can be inferred.

- A sufficiently powered computer is required. In 1990, I started using a black and white LCD panel that sat on an overhead projector. Of course, no one had fitted the fan on the panel, so it was starting to burn out. And it only worked in text mode. But, worst of all, it was connected to an antiquated 8088 PC/XT computer. After purchasing software to context-switch between applications (for demonstration purposes) and word processor (for notetaking and notes display), the context switch time was about 20 to 30 seconds, far to long to wait doing nothing in class. The problem was an insufficiently powered computer. That and the transportation cost and setup/takedown cost led me to suspend the effort after one semester of determined effort. Computers and multitasking operating systems are now readily available such that this is less of a problem than it used to be.

- Text, graphics, audio, and video are required. These facilities generally require both input and output devices (unless one is running canned software that, in many cases, require only output devices). Input devices usually present more problems than output devices. The plethora of storage formats requires one to verify beforehand that a gadget to do input and/or output will in fact produce files in a storage format supported by the rest of the system and, in doing so, interoperate with other system software.

- Finally, software is required to let the user navigate, interact, create, and communicate as desired. There are many packages available. This paper will be limited to off-the- shelf software that is readily available in most University settings, such as Microsoft Windows and Office (Word, Excel, Access, PowerPoint), NetScape (HTML links), and software that is included with input and output hardware gadgets for text, graphics, audio, and video.

Of course, most instructors must use multimedia in the context of an institutional system, not having the resources (e.g., time, money, technology, approval, etc.) to do it alone.

Institutional Multimedia System

Some minimal top-down design considerations for an institutional multimedia system include the following (Snyder, 1922).

- The instructor should be able to take work involving text, graphics, sound, and video from/to the desktop to/from the classroom. This avoids the costly task of preparing physical overheads manually, is environmentally appealing, and can be used to enhance classroom presentation.

- The capability in the classroom and on the desktop should be similar, since additional capability in the classroom that is not on the desktop will not get used, and additional capability on the desktop that is not in the classroom will create frustration.

- Students in the class should be able to easily see what is presented.

- Students should be able to electronically interact with the instructor (for attendance, exams, surveys, etc.). This capability gets into workgroup and idea processing software and is beyond the scope of this paper.

If an organization does not have in place a system that provides general capabilities for multimedia for instructional support in the classroom, how can one get started now?

Environments and Gadgets

The author teaches classes in at least three environments.

In the first environment, the classroom is in the same building and, sometimes on the same floor, as the author's office. The author's office computer has been placed on a heavy-duty plastic cart designed for an overhead projector. Thus, the cart (and computer) can be moved to and from the classroom. In order for students to see the screen, a TV/VCR is (usually) provided by the media center of the library and connected to the computer via a VGA-to-TV converter.

In the second environment, the classroom is at an off-site location 40 miles from main campus that has some stand-alone workstations on a small network with a VGA-to-TV converter and a TV. In this case, some software and data files must be transported via floppy or Zip disk to and from the

site. No CD- ROM drives are currently available.

In the third environment, which covers anything not covered by the other two environments, a laptop computer with a VGA-to-TV converter is used. The laptop computer has an internal fax/modem, a parallel and a serial port, and connections for external video, keyboard, and mouse. A CD-ROM drive is not currently available.

Getting information into and out of the computer is an important part of multimedia gadgets. One way to share gadgets between environments, that is, to have interoperability of gadgets between different environments, is to use gadgets that interface via common hardware ports (e.g., VGA port, keyboard port, mouse port, serial ports, parallel ports) as opposed to gadgets that interface via proprietary ports that require that a special board be installed in a slot of a computer according to the bus architecture of the computer (e.g., ISA, MCA, etc.).

Oh say can you see

The most important part of the system is the way in which students see what is on the screen. Color LCD projection panels that allow full motion video tend to be expensive, in the $4000 range. They also can be broken if dropped, and are easily stolen. In addition, overhead lights must be dimmed with the consequent disadvantages in the classroom.

Although large (e.g., 31 inch) high resolution monitors are quite expensive, in practice, lower resolution (and lower priced) TV screens (that are readily available at most institutions) are suitable for most classroom instruction. One must realize that the student need not see every little detail of the screen. In practice, it is very beneficial for the student to see the intuitive direction of the instruction, and not every little input (i.e., keystroke and mouse movement) and output nuance (i.e., the screen).

True story: I assign assignments that require a word processor and spreadsheet. Some students would spend 20 hours or more working on the spreadsheet part of the assignment. One week, I actually did the assignment on the spreadsheet in real time. The jaw of one of the students dropped with a look of amazement. Here, I had done in 2 or 3 minutes what had taken her many many hours of work.

Since then, I have made it a routine practice to show, as it were, a "proof by example" that the actual work is not that difficult, if only one understands the problem and the software. Complaints about spending too much time have dropped significantly. And, if something is presented on the screen that the student does not understand, or if a shortcut is used that could save the student a lot of time, the student will stop the instructor to find out how it was done. This is a demand-driven goal-oriented approach to learning and problem solving.

True story: A student who had used Windows at work for over two years stopped me when I moved a window by dragging the title bar of the window to a new location. "How did you do that?", the student exclaimed, "I've never been able to get those windows where I want them.". I thought that the student was joking, but he was very serious and, in fact, did not know how to move windows. He was very appreciative of his newfound capability.

Given that a TV with a video-in (or a TV/VCR combination with a video-in) is available, one connection alternative that works well in practice is a low-cost VGA to TV converter. Cost: About $120. Installation: Unplug the computer VGA output cable from the monitor and plug it into the converter. Then, plug the VGA output cable of the converter into the monitor. Then, plug the TV output cable of the converter into the Video-in of the TV (or VCR). Of course, connect the power supply via the transformer brick. Many converter models also support S-Video (which does not cut off any of the horizontal part of the VGA screen).

The computer/cart combination has a VGA-to-TV converter permanently installed on the cart to minimize setup/take-down costs. However, if students want to use their laptop computer for a presentation (e.g., they use a different operating system and/or applications software), the appropriate cable is switched from the computer on the cart to the laptop and they are ready to go.

In Windows, the loss of part of the screen is not crucial, since the Window can be resized so that it appears entirely within the part of the screen visible on the TV. The author has written simple macros in Word, Excel, etc., that automatically reposition the window appropriately so that the repositioning need not be done by hand. And, in many applications programs, the font sizes can be changed to make it easier to see details on the TV screen.

> Fallacy: With screen display, there is no need for a white board or overhead projector and screen.

Why should one technology replace the others? I find that, although this may seem obvious, it is quite necessary in practice to justify such concerns. I actually would prefer two or three overhead projectors. One for concepts that last throughout the entire class period, one for new information, and one for the previous slide, to allow both instructor and students to refer back to. In practice, it is difficult to get even one overhead projector that focuses and has a working bulb that does not burn out during in class (who keeps the spare in its place, anyway), and, hey, who needs a screen anyway, just use a white board. One must then politely inform those advocating that policy that using a white board as a projector screen causes a large white spot of glare that is quite irritating to most observers. But, a white board is useful at times. I often have to deal with projector screens in one direction, a TV screen in another direction, to white board in another direction, and the podium in yet another location. Perhaps the students should get credit for a 1.0 credit physical education course in exercise of the neck.

Ergonomically, the TV should be positioned such that glare from overhead lights (in classrooms not designed for such presentation) is minimized. This often requires removing lights close to the screen and, in some cases, tilting the TV screen slightly. Unfortunately, the TV is often installed without such considerations in mind and it may be difficult to change (the orientation of the TV) after the fact.

Output Gadgets

Some other output gadgets and/or software used by the author include the following.

- Logitech AudioMan microphone/speaker (connects to parallel port) is used for sound

input/output. The sound is not as good as a dedicated sound board, but the device is small and portable. Cost: About $100.

- Labtec speakers are used for (louder) sound output in a classroom setting. Cost: About $20.
- An AverKey VGA to TV converter is used for TV output (discussed above).
- Microsoft Word, Excel, Access, and PowerPoint software is used for overhead presentations.

Note the absence of a CD-ROM player in the portable system. CD- ROM players connected via a parallel port are still costly and perform poorly (due to slow throughput via the parallel port). This means that canned programs on CD-ROM cannot, at this time, be used with the portable system. A CD-ROM player is available, however, on the computer/cart combination.

Input Gadgets

Some input gadgets and/or software used by the author include the following.

- A wireless mouse (one less wire to worry about) provides some freedom from being bound to the computer. Cost: About $90.
- An external keyboard provides some freedom from being bound to the laptop. A wireless keyboard/mouse combination would be nice.
- A Logitech ScanMan EasyTouch scanner (connects to parallel port) is used for scanned input. Cost: About $200. Logitech OmniPage Direct OCR software (bundled with the scanner) is used for OCR (optical character recognition) purposes.
- A Logitech FotoMan camera (connects to serial port) for real time picture taking. Cost: About $600. Logitech FotoTouch Color software (bundled with the camera/scanner) is used for photo image processing.
- A Logitech AudioMan microphone/speaker (connects to parallel port) is used for sound input/output. Cost: About $100. Logitech AudioMan software (bundled with the microphone) is used for audio sound processing.
- A Connetrix VideoCam (connects to the parallel port) is used for real time movies and pictures. Cost: About $100. Connetrix VideoCam software (bundled with the camera) is used for movie and/or picture processing.

Reliance on Technology

Preparing course instruction that uses multimedia technology can be a time-consuming endeavor, even with the best of hardware and/or software. In (expensive) self-contained personal multimedia systems, this effect can be minimized. But when the instructor requires that a larger institutional system not fail, chances are that some part of the system will fail. For example, if an adequate

display mechanism is not available (e.g., the library media center forgot to deliver the TV/VCR combination, etc.), what is to be done?

As we rely more and more on information systems and computer technology, the failure of any one part of that technology can cause the entire system to fail, with potentially catastrophic consequences. In terms of this paper, catastrophic in that the class cannot be taught as planned and some alternative presentation needs to be done on short notice. This need happen only once for the instructor to be discouraged from continuing that course of action.

True story: I was teaching class on the first floor using the computer/cart combination. My office is on the second floor. A lightning strike causes power to be disrupted. The power goes out for several seconds. Although the UPS (uninterruptible power supply) on the computer kept the computer running throughout the blackout, the elevator was knocked out. In this case, there was no place to store the computer and it took about an hour to disassemble the computer/cart combination, carry it up one floor, and reassemble the computer/cart combination.

The only viable solution to the technology dependence problem seems to be to make each part of the system as reliable as possible, with provisions for fault tolerance. In overhead projectors, this means having a spare bulb. In classrooms, this means having redundant TV/VCR combinations, or at least, reserves that can be committed on short notice to immediately rectify the solution. In the case of lightning strikes knocking out elevators, it means having a computer with TV connection in the classroom that is connected to the campus network (which does not go down in the middle of class). And so on.

Instructional Uses

Multimedia can be used for many purposes. In teaching MIS and other computer related courses, multimedia is used to teach multimedia (and other information systems and computer technology material). Such an introduction typically goes as follows. Note that the conference presentation will lump these ideas together. In an actual course setting, the material would be distributed over many weeks with a fuller discussion of each of the concepts and word problems provided to be solved as exercises.

- Use Microsoft SoundBits (Flintstones, Jetsons, Yogi, etc.) to grab the attention of the students.
- Set up the video camera "eye" before class and see the reactions of students as they realize that the computer is watching them.
- Take each student's picture with the camera. Note that it can take substantial time to download the pictures via the serial cable to the hard drive of the laptop. Analyze the transfer rate problem while it is happening.
- Crop an appropriate part of each picture and save each as a TIF and BMP file on the hard drive.

- Display the pictures on the screen. Change shades of gray, rotate the picture, draw a mustaches on a selected photo,etc.
- Print out a class listing with pictures.
- Record each student saying their name into the microphone. Display the sample, and save each as a WAV file on the hard drive. Assign one of them to a Windows action, such as maximizing a window.
- Play each student's voice file using the speakers.
- Scan text (via OCR software and OLE support) directly into a document. Note the problems in doing the conversion (i.e., it is not 100.0% accurate).
- Scan a picture from a magazine. Display and print it to illustrate the differences between gray scale and line art.
- Fax a line art picture, just scanned, to a nearby office. Discuss how a fax machine handle graphics, data compression, etc.
- Show the scalability differences between scanned bit maps and vectorized (scalable) fonts, etc. A discussion of PostScript graphics and EPS files is appropriate here.
- Print individual pictures with sound waveforms for each student.
- Supply each student with files for their picture (BMP, TIF, EPS), sound (WAV, EPS), icon (ICO), etc.
- Have the student import EPS files directly into their work for output on a (PostScript) laser printer.

Students find these exercises very interesting and relevant. A practical use of the system for the teacher is that names, faces, and correct pronunciations of names can be more quickly learned.

Problem Solving

It is not enough for a student to see what is being done and say, "Yes, that's impressive.". A primary objective, from a quantitative and MIS point of view, is to drive home the cost of processing multimedia information in terms of storage space and transfer times. One way to do this is with word problems. Word problems that now have some relevant meaning, such as the following:

- A sampling rate suitable for voice recording (not high fidelity music) is 11KHz (1 KHz is 1024 samples per second). If each sample can have one of 256 possible sound frequency values (Hint: How many bytes per sample are required?), how much sound can be put on a floppy disk that has a maximum capacity of 720KB? Give your answer in terms of hours, minutes, and seconds. Briefly discuss how this method compares with using a cassette tape

recorder?

- A photo has a width of 100 dots and a height of 200 dots. Each dot can have 1 of 256 possible gray scale values. How many pictures can be put on a floppy disk that has a maximum capacity of 720KB? What happens if we decide to store photos that have a width of 200 dots and a height of 400 dots (that is, twice the resolution)?

- Why might we want to compress sound and picture files? What are some possible disadvantages of data compression?

Notes: In the second problem, doubling the resolution requires four times the space requirements. The last question is asking for a specific answer that uses the results of solving the previous two questions.

From experience, assigning these word problems without a relevant context will tend to cause resentment and lack of motivation on the part of students. Comments such as, "But we will never use this", are commonplace without a relevant context. But once a student has experienced the process first hand, and have in their possession a disk with their own picture and voice, and can see how many bytes are required (50KB to 150KB for the picture file, 20KB to 60KB for the sound file), the student can better make decisions concerning implications of multimedia use.

This demand driven goal-oriented approach to problem solving and learning by workers in business and industry is called Just-In-Time learning by Hofstetter (Hofstetter, 1995), although the same techniques can be applied to students in an academic environment.

Storage

When working with large files, which is the case in multimedia (and databases), some form of backup and transportable storage is essential. It has been said (by Arthur Clarke) that magic and sufficiently advanced technology are indistinguishable. That is the way I felt when I first obtained an Iomega Zip drive that boasts a 100MB floppy disk. I now have three Zip drives (one for home, one for work, and one as backup and for the road) and a backup disk for each day of the week, allowing both a multilevel source file backup and a way to automate transfer of large files and large numbers of files between computer systems. The Zip drive works via a SCSI or parallel port interface, making it easy to set up and transfer information between computers (in this case, any Intel-based computer running DOS and/or Windows). Although the transfer rate is slow for large amounts of data, it is much faster than 1.44 MB floppy disks, especially when only files that have been changed are being updated. On a foreign computer, one can plug in the Zip drive, run the guest.exe program that autodetects and add the drive to the DOS drive list, and then use the Zip drive as any other DOS drive. Cost: About $200 for a Zip drive with one disk. Disks cost about $20 each.

Power Supplies

With a number of gadgets it is inevitable that most of them have their own transformer brick (some small and some not so small). It should go without saying that one should not plug the output of a

transformer brick into the wrong device. To avoid this problem, put a label on each indicating what device it is for. One can also add matching number and color coding on both the gadget and the transformer brick. On a cart, it is advisable to either hide the cables and wires, or, at least, wrap them around the legs of the cart to keep them from getting loose and grabbing onto something and getting torn apart.

Parallel Ports

The standard parallel port on most computers, called LPT1:, is very convenient for connecting devices, but is somewhat slow. And, with many multimedia gadgets, each of which wants to own the parallel port, each of which allows a printer bypass but does not support other gadgets, and each of which recommends that you power down the computer before plugging and/or unplugging cables, it is desirable to have more than one parallel port. One attractive solution, and the one used by the author on the desktop computers, is to add two high-speed bidirectional parallel ports (requiring one slot each) that can be configured to use high IRQ's (interrupt levels, of which each computer only as a few free ones), and act as LPT2: and LPT3:. Cost: About $45 for the first additional port and $30 for the second additional port. Technical installation required (i.e., inserting chips, installing the board, setting switches on the board).

Theoretical Concepts

There are a number of practical and theoretical concepts whose underlying models are essential to avoiding a time-consuming trial-and-error approach to multimedia objects (in the form of text, graphics, audio, and video) and usage. A sampling of these concepts include the following.

- An understanding of bits and bytes is essential to forming a model of multimedia objects.
- Multimedia objects can be compressed using lossless or lossy compression schemes.
- Multimedia objects can be encrypted/decrypted.
- Multimedia objects can be stored in a variety of file formats.
- Multimedia objects can be shared via OLE (object linking and embedding).
- Audio sound can be sampled, smoothed, filtered, converted to/from analog/digital, and represented discreetly as MIDI.
- Graphics requires an understanding of coordinate schemes, Bezier curves, lines, polygons, scalability (dpi), gray scaling, thresholding, dithering, light and color models, texturing, printing methods, and animation techniques.
- Information can be stored as hyper-text, hyper-media, searched, and shared via clipboard and/or DDE techniques.

Summary

This paper has presented a specific bottom-up implementation method for getting started with multimedia for instructional support at the personal level. There is a learning curve to the entire process, so you might want to gather ideas and get started as soon as you can in whatever way you can. It is hoped that this paper has given you some of those ideas from which the reader can pick and choose as desired. For more general information, see, for example, (Hofstetter, 1995).

References

Hofstetter, F. (1995). Multimedia literacy. New York: McGraw- Hill.

Snyder, R. (1994). **An institutional multimedia system for instructional support**. *Proceeding of the 8th Annual Computers on Campus*. Myrtle Beach, SC.

Bridging the Multimedia Generation Gap

Janet Hurn
Department of Physics
jehurn@miavx3.mid.muohio.edu
(513) 727-3341

Nancy Thibeault
Computer Facilities
nethibeault@miavx3.mid.muohio.edu
(513) 727-3355

Miami University
4200 East University Blvd.
Middletown, OH 45042

The Problem

Miami University in Middletown Ohio is one of two regional campuses of Miami University, a state institution serving approximately 20,000 students. The regional campuses serve a large number of nontraditional students in two year degree programs and the first two years of the four year degree programs. Our particular campus serves approximately 2300 non-resident students who commute from as far north as Dayton, Ohio and as far south as Cincinnati, Ohio. These students come to our campus with a wide variety of educational needs and goals. Part of the new educational needs of today's student is to be computer literate. They need to be competent with standard computer tools such as spreadsheets, word processing, and data bases. Employers are routinely expecting this to be the case. Our students also have severe time and resource limitations based on family and geographic constraints. One way to alleviate some of these constraints is to employ technology to give the student more control over the time and location of some aspects of their educational experience. This can be achieved via computer based lessons and tutorials, and the use of E-mail and Internet services. It is a component of our mission to meet the educational needs of the region and increase the accessibility and success of our students. In order to satisfy this mission, faculty need to teach and utilize technology.

Much of the business world has surpassed the educational world in using computer technology efficiently to improve communications and productivity. We recognized this and our students' changing needs and sought to increase the use of computer technology in our classrooms. This led to examining why this was not naturally occurring. What we discovered was a "generation gap" of sorts between the younger students and the nontraditional students and faculty. Our faculty was reluctant to employ multimedia and computer technology and clung to the overhead projector, blackboard, and video tape. This reluctance was emphasized by their own hesitation in using tools such as E-mail and Windows for their own work. Yet some of our students were at home using and writing Visual Basic programs, multimedia, spreadsheets, and computer based tutorials. This paper outlines our ongoing efforts to bridge this gap and encourage our faculty, staff, and students of varying ages to engage in using computer technology to facilitate the educational process.

Initial Attempts to Solve the Problem

Through speaking with colleagues and personal observation, we discovered that the available computer resources were not being used effectively by our faculty and staff. Windows based programs were not being used. Many faculty and staff were not using E-mail to communicate. We decided that it was merely a lack of knowledge problem and so we offered several workshops on E-mail, Word, and Excel. "Bring the knowledge to the people and they will embrace it", was our battle cry. How wrong we were. The workshops were poorly attended. Those who attended seemed pleased with the information received but most did not continue to use it after the workshop.

That led to asking ourselves a question, "why were we so enthusiastic about all this new technology and our colleagues were less than enthused?" The answer came from looking at how we were exposed to and learned about multimedia and technology. We looked into our classrooms and our computer center. What we saw were students who were proficient in using Windows, E-mail, and many other computer technologies. There was a font of knowledge just waiting to be tapped. The only reason one of us started using Windows was because a student demonstrated how "easy" it was. There is something about a student knowing a little more than the professor that is very motivating. But rather than feeling "dumb" or embarrassed, we started soaking in all the students' information we could. Their excitement increased our excitement. It also increased their self esteem to be "teaching the teacher." We began noticing all the talented young computer users on our campus. Now the task became uniting the two fronts to accomplish our goal.

The First Instructional Technology Fair

In the spring of 1995 we held the first Instructional Technology Fair on campus. The purpose of the fair was to show faculty, staff, students, and the community what was available in hardware and software on our campus. We first contacted faculty who had used some multimedia in the classroom and asked them to display what they had done and be present to answer questions. This included the Nursing Department which had been using interactive video and automated medical devices for some time. One professor in Business Technology demonstrated a tutorial created in Authorware. Another History instructor showed off a CD, "Who Built America", she used in class to teach American History. This was a start but hardly enough for a fair. We both caught the spirit and developed several displays in PowerPoint. But this was still not enough. Again we turned to the students. We introduced the idea to several particularly knowledgeable students. That was all it took. They went to work and developed what turned out to be the highlights of the fair. One student developed an interactive tour of our campus using Authorware. Another developed a Web page that made our other campuses so jealous they developed theirs almost immediately. In the end we had twelve different contributors with two or three projects each. We decided to fill in with various booths demonstrating CU-SeeMe, PowerPoint, Netscape, and video capture.

Now we had the makings of a fair. But how do we lead the horse to water? Make it so he trips over it! We put it in the lobby of our main building right near the Information Desk and the cafeteria. You could not possibly miss it. We also combined it with a Faculty Senate meeting and a visit by our new Provost. We made a brochure to publicize the two day event and drafted volunteers. The press was invited. We tried to generate as much anticipation as we could. It worked! The event was a great success. Faculty, staff, and students all found that they were not really aware of what was available

for their use. People were amazed at what the students were capable of doing. The press ran a nice article in the local paper. Teachers from some of the local high schools visited and stated that they got some good ideas. We succeeded in our goal of generating some excitement and enthusiasm.

Capitalizing on the Excitement

In the fall of the following year, a PowerPoint show featuring pictures that were "captured" from the fair was presented at the opening Faculty Senate meeting. One sure way to capture a colleague's attention is to put their picture up for all to see, (especially if they did not know you took it). The presentation also outlined workshops and events for the coming school year.

We then presented a series of PowerPoint workshops for any interested faculty and staff. This time the workshops were well attended. We developed a three part series in order to attract the beginners as well as the more advanced. Three different faculty members were in charge of each part while the other two were helpers. This helped to split the preparation burden up a bit. In addition the students who were most productive at the fair were enlisted to assist at the workshops. This was extremely helpful in breaking down some of the intimidation barriers that both students and faculty face when their roles are reversed.

The series ran as follows:

Part I - Creating a PowerPoint Presentation:
This included the basics of PowerPoint and what it was capable of doing. Everyone was stepped through creating their own presentation beginning with the Presentation Wizard.

Part II - Incorporating Sound and Pictures into PowerPoint:
This segment included scanning pictures and recording sound from a microphone or CD and then incorporating this into a document. A script was written to follow and the participants then inserted the picture or sound of their choosing.

Part III - Incorporating Video into PowerPoint:
In this segment participants learned how to capture video from their own video tape. They were also instructed on the use of basic video editing software. Then they incorporated them into a 1 or 2 slide presentation.

The workshops ran about 1 1/2 to 2 hours each and were spread out over the fall semester. Some participants ran through the entire series. Some who were reluctant to get too complicated stopped after the first one while others who were not beginners chose to begin with part 2 or 3.

The keys to success:

-splitting up the planning among three different people
-involving students as helpers
-having a low student to teacher ratio (it was about 5 to 1)
-having workshops at different knowledge levels that ran consecutively

Interestingly enough we also noted that staff took more advantage of the opportunities than faculty. Our admissions and advising staff especially seemed interested.

Keeping the Students Enthusiastic

One problem our campus faces being primarily a two year feeder for the Oxford Campus is that our student turnover is rapid. Each year we gain some very talented students who are capable computer users, but we only have at most two years to tap into their knowledge base. One of the best ways is by searching them out and hiring them as student technicians in the computer center and allowing them to develop their areas of interest. This allows for lots of interaction between these students, faculty, and staff. But it is important to foster more students to replace those that are leaving and to keep their level of interest and enthusiasm high. We decided to resurrect the computer club. We found that a charter existed but that the group had been defunct for some time. We gathered our small flock of students, got them interested, and started publicizing. The initial response was good. Fifteen students were at the first meeting and officers were elected. For about two months things seemed to be going well but then attendance at the meetings began to wane. This happened for two reasons. One was that a small number of already overburdened students were doing all the work. Secondly the topics chosen for the first two meetings were too technical for the general student population and frightened many of the beginners away. We have not said die yet. We plan to try and resurrect the group next fall with some changes.

Reaching Across Disciplines

Another problem that we have identified is the lack of proper equipment and its availability to faculty for creating educational technology. Our University has a grant program called the Learning Technologies Enrichment Program (LTEP). Its purpose is to provide funding for equipment that will enhance the University's learning environment through broadening the application and integration of technology into the curriculum. Our project involved the purchase of a multimedia work station placed conveniently for use by various Nursing, Math, Physics, Education, and Chemistry instructors who made a commitment to produce a multimedia project within the next year. The project includes some instruction on the use of the equipment and various software and ongoing support. The faculty involved are relative novices at multimedia production and use. We have found that the faculty are more comfortable working with others of their same level. All the faculty have offices on the same floor as well which adds to the camaraderie. There are always benefits to sharing across different disciplines. Faculty have shared ideas for the use of multimedia that then sparks an idea in another field. For example the chemistry instructor suggested making computer models of molecules that can be turned at different angles to show a student how the same molecule can look vastly different if turned. This inspired Janet to explore a three dimensional ray tracing engine (POVRay) that she now uses to make three dimensional models that students otherwise had trouble envisioning.

The Second Instructional Technology Fair

In the spring of 1996 we held the second Instructional Technology Fair. This year we included a contest and invited our Associate Provost for Computing and Director of Faculty Development from the Oxford Campus, and the vice president of a local bank to be the judges. We had several categories including novice faculty, novice student, faculty, student and best of show. Vendors donated prizes as well as the campus providing gift certificates at the campus bookstore. Brochures were printed and distributed around to the local schools. We invited the Provost and press again and

added punch and cookies to the list of offerings. We also expanded the amount of space but stayed in the lobby area to increase the traffic flow through the fair.

The entries were displayed grouped by type of project. For example, a continuous sampling of the PowerPoint projects were displayed on a projector while the individual projects could be viewed on an adjacent desktop. We also had a large number of World Wide Web pages. These were set up on a desktop and could be viewed from a master page. Windows 95 was displayed along with Netscape 95. We also projected the video capture booth on to a screen and combined that with morphing the images we captured. That drew lots of attention. The highlight of this fair was the faculty DOOM game that a freshman student altered to include the faces of several faculty members and the Executive Director of the campus.

The participation rate was higher for this fair. We had 38 projects submitted by 26 different individuals. Student participation was especially high. In fact we got a few students that we did not expect who did some neat projects. We also got some novice faculty who did some interesting PowerPoint projects. Unfortunately participation was weak from some the experienced faculty. One problem was that the call for projects was done in the fall but not again until late winter. Attendance at the fair was low on the second day of the two day event partially due to outstanding weather conditions. Next year we plan to include more hands on booths which seem to encourage experimentation and participation. The participation and expertise of the students seems to drive the faculty to try more new things.

Continuing the Mission

In the past, we had offered faculty/staff workshops on various software packages taught by faculty volunteers. The workshops covered E-mail, word processing, spreadsheets and databases. We would offer one or two workshops in each area every semester. These workshops were poorly attended (four to six participants per session).

We discovered that we had many students who had never touched a computer who were being expected to use a word processor to write a paper and E-mail to communicate with their professor and classmates. Faculty were assuming that the students would learn these on their own. The students would show up at the computer center and expect an individual tutoring session which overburdened the computer center staff. This spring we expanded our workshop offerings and opened them up to students. We developed tutorials and then staffed the workshops with volunteer student, faculty, and staff . We offered four sessions on each topic and scheduled them on different days at varying times, morning, afternoon, and evening. Enrollment increased dramatically to 15 - 20 participants per session. Many students who were not required to use theses packages also attended the workshops.

Summer Institute of Learning Technologies

This summer we are organizing the first Summer Institute of Learning Technologies. This will be a week long intensive workshop targeting the novice faculty. The workshop will be four hours each morning. Topics will include E-mail, using the World Wide Web for research, and Web page development. After teaching these programs to each participant, the participant will be expected to

modify an existing course syllabus to include the new technology. They will be guided by faculty who are already using these technologies successfully. The week will be ended by a keynote address by a prominent Professor in the field. Faculty will be given an honorarium for their participation. We hope the small class and personal attention will give faculty a "safe" environment in which to learn.

Conclusions

Our efforts have increased the use of technology among the faculty and staff of our institution. Approximately 17% of our faculty are aggressively using some form of technology with their students. These applications include:

- communications using E-mail and newsgroups
- spreadsheets and data analysis packages
- research with World Wide Web
- distribution of course materials through Netscape
- class presentations using PowerPoint
- computer based tutorials
- interactive video discs

Faculty and staff use of multimedia has increased by over 50% over the last two years. Faculty and students are beginning to speak the same language. But there is still work to be done.

Problems still remain including:

- lack of high level computers for faculty (greater than 386)
- lack of display capabilities such as projectors
- lack of time for education and participation
- lack of mediated classrooms

We have targeted some things that have worked very well including:

- involvement of knowledgeable and patient students
- series based educational segments over specific software (see below)
- allowing the students to show off some of their expertise
- exposing the faculty to new technology in an informal setting
- requiring faculty committment prior to participation in workshops and grants

Some of the software that we have had success with include:

- PowerPoint
- Authorware
- Netscape
- Visual Basic

Our main focus has been how to use the tools. In the future it will be important to show faculty and staff not only how these technologies work but how they can be effectively incorporated into the curriculum to enhance student learning. Many of our young students are entering college highly computer literate. All students entering the work world are expected to be computer literate. Our goal with these programs is to bridge the gaps that remain.

USING TQM: A NEW TEACHING MODEL

Nancy S. Thomson
Department of Computer Science/Information Systems
Northwest Missouri State University
Maryville, MO 64468
THOMSON@acad.nwmissouri.edu

Focus and Objective

The current management frenzy of applying Total Quality Management concepts to enhance business practice is pervasive in profit and non-profit firms. Its tenets have recently been tested by academia as a possible model for improving the quality of education. This paper addresses the infusion of the TQM principles at the course level in order to provide students with real working knowledge of what TQM means as a life skill. Students actually use (experience) the TQM principles as a method for improving their learning process and activity while building their knowledge and skills base.

The objective of this innovative teaching model is to: Use the Total Quality Management concept in course design and implementation in the MIS curriculum; Develop attitudes and behaviors associated with this type of thinking in the students, Provide flexibility in the development of senior level courses, and
Expand the learning process beyond traditional barriers while developing increased knowledge and skills in information technologies.

Uniqueness of Approach

This approach is unique in that it incorporates a new technology--TQM directly into the learning process. This process focus creates an environment in which the undergraduate student takes a concept or idea about which they know very little--planning organizing and controlling their traditionally passive learning environment--and transforms it into an active, participative one. In the process the student builds the course content, determines schedules, evaluation methods and criteria and then proceeds to carry it out. Students become empowered to determine outcomes; have freedom to fail, learn from their mistakes and redesign and improve learning toward a purpose and goal they have developed and internalized.

Level of Students

Students are generally seniors in their final semester. They have completed nearly all of their course work in the business core, have had at least two programming languages, and MIS courses such as telecommunications, systems analysis and design, and management models. Their course of study is tightly constrained within the 124 required hours for graduation leaving only three to seven hours of electives. Several students have double majors such as accounting, finance, international business, or math.

Content and Process of Learning Current IS Topics

A variety of inefficiencies and waste exist in the traditional learning environment. Examples include: tying all course information to a single source--the professor; sub optimizing the depth and breadth of learning activity for individuals via satisficing for the class as a whole; inflexibility of course content of a single syllabus when students enter with varying degrees of experience and background as well as different career goals; and maintaining the locus of control and power in the professor. Using the Total Quality Management philosophy to design the course requires a focus on the student as the "customer/client", on the process of learning activities, and on continual improvement of this learning activity.

Traditional teaching/learning activity focuses on content, i.e. knowledge, not process. Therefore, students expect to only be held accountable for that content with little attention paid to the process of building their knowledge. When they are brought into the process as designers and creators, they develop behaviors which inherently focus on improved quality of performance and knowledge acquisition.

This is especially applicable in the field of Management Information Systems as a thorough understanding of the acquisition, manipulation, and storage of information is fundamental. Additionally, the dynamic field requires continual learning and upgrading of knowledge and skills. Knowing the "what" is often not nearly so critical as knowing "how to find out" about the "what."

TQM is primarily a mentality which must be absorbed into the activities of ones daily work with a focus on making the product or service outcomes more effective, efficient and thus satisfying. The approach outlined below operationalizes that philosophy in a teaching/learning environment which enhances the ability to learn information systems concepts and applied technologies.

Organization

Students are instructed at the first class meeting that these are the criteria for the course:

1. This is not a "class" like any other class, it is a learning experience.

2. The learning experience will be individual specific and designed by the student. (with appropriate help and guidance)

3. Their focus will be upon course content learning as well as learning as a process activity.

4. Each individualized study plan must focus on current and relevant information systems topics and must include:
   a. a group project/study activity
   b. an individual project/study activity
   c. an outside presentation
   d. produce incremental knowledge building upon relevant MIS fields or topics

5. Course goals include:
    a. development of documentation skills through
        (1) development of a complete course proposal,
        (2) taking, verifying and disseminating minutes of meetings,
        (3) establishing and recommending agendas,
        (4) accountability via work activity and reports.
    b. development of leadership/knowledge building skills through
        (1) presentation of incremental knowledge gained through live study and experience,
        (2) calling and presiding at meetings,
        (3) facilitating teamwork,
        (4) making effective decisions,
        (5) influencing others,
        (6) creating, executing, and evaluating plans,
        (7) accepting responsibility, demonstrating professional integrity
        (8) use of judgment and reason,
        (9) THINKING.

6. The professor's role is that of facilitator and advisor.

7. Reference guides are distributed for locating research literature relating to MIS topics. Students are instructed to read and skim a minimum of six periodicals for at least the past six months to develop an awareness of current topics in the field. They are then to word process a two-page synopsis of 5 relevant topics along with a rationale for why they are important and why those were selected.

8. Classes meet once per week for three hours.

Presentation Activity

Initial Class Activities. The second class meeting is devoted entirely to collectively sharing and assessing pertinent topics gleaned from the research. The students assignment for the following class meeting is to take the knowledge they have gained from this discussion, assess their own interests, career goals, and their individual strengths and weaknesses via a letter of application, resume, and transcript and return with a tentative course of study **worthy of three hours of university credit.** The instructor selects a student to record the minutes of the third class meeting.

The third class meeting is then devoted to discussion of similarities and differences among the course plans (which tend to be very incomplete and undecided at this point). Groups then form to discuss appropriate alliances as well as divergent needs or foci. Students tend to be very frank and challenging when someone appears to not be "putting out the effort" to meet the challenges set before them.

A Course Plan Guide handout listing all core requirements for successful completion of the plan of study is provided at the end of that meeting and a discussion of the requirements for completeness of the course proposal is delineated regarding specific requirements. Additionally,

sample daily, weekly, and semester calendars are distributed to encourage documentation of tentative plans. It is noted that these will be used as a basis for determining project meeting times and dates as well as research activities.

An important component of the course study plan is the establishment of a project/research activity with an external constituent to whom they will have responsibility. Examples of these types of activities have included analysis, design, purchase, and installation of a local area network for a non-profit organization, installation of software and training a small business owner on his PC, development of multi-media presentations for beginners to learn software, and Internet presentations at Regional conferences.

Each student is required to set up an appointment for consultation regarding their individual study plan. They are instructed to meet with other group members of their respective groups prior to the meeting with the instructor so that those agreements can be included.

For all following "staff" meetings (as they are to be called) a recorder will take minutes. These are to be created and distributed via e-mail to all participants for their review and comments prior to the next meeting. The recorder will then become the chair of the next meeting and will select another student to record for that meeting. Thus, each student accepts responsibility for reporting, communicating, and directing meeting information.

By the fourth meeting, course study plans are nearing final stages of revision. Minutes of the previous meeting are noted with corrections. A format for conducting meetings is established by the students. Students arrange for a one-on-one meeting with the faculty member outside of class time and a more detailed evaluation is done following the guidelines on the "Course Plan Guide."

By the fifth week, meetings are being entirely run by students, courses of study have been thoroughly analyzed and evaluated, schedules are set, and contingency plans are in place. Students at this point really begin to show initiative and leadership behaviors. Their professional focus and interaction is clearly observed. It is helpful at this meeting to have developed a composite guide of course proposals in a spreadsheet format.

Students are not told they are participating in a TQM activity. By the time they get to this point in their business related curriculum, they have been inundated with the "words" about this topic, it is therefore, not presented as a part of the course content. Instead, they are simply lead through a process of developing the skills related to the concept. Each meeting becomes a learning and sharing experience where continuous improvements are sought in how meetings, communications, and learning activities are efficiently and effectively handled.

Electronic Communication's Role

Our campus is equipped with electronic campus mail and Internet facilities to all campus student rooms, offices, and labs, and dial-in is available for off-campus students. Extensive use is made of e-mail facilities for distribution of announcements, group activities and updates, as well as discussion between individuals and exchange of information. For most students e-mail is not viewed as a primary mode of communication between faculty and students as well as between other

students. Therefore, proper etiquette of handling e-mail is incorporated into the course activities.

Minutes of meetings and agenda for up-coming meetings are composed and distributed via e-mail. Continuous contacts can thus be maintained and immediate feedback can facilitate the time spent in "staff" meetings. Many issues or questions are resolved between two or more members without taking any of the limited and thus precious meeting time.

This not only enforces the technology component as a "matter of course" for users, but also encourages exploration on the Internet for a variety of sources of information. It frees up the participants to engage in conversation multiple times and in multiple locations under a variety of circumstances. For example, a study group may be in the library and need a response to a question. They e-mail the message(s) as the meeting is in progress. Everyone is instructed to check their mail frequently. Responses often come immediately as someone may be working on the computer system when the message posts and transmits a response.

E-mail also encourages creative ways to get their point across and create influence upon others. It is a difficult medium to develop skill in using effectively and this experience greatly enhances that potential. Each one is encouraged to provide appropriate documentation for each message, sign it, and give complete information. Anyone not responding to their e-mail messages is questioned by and/or in front of the group and reason must be given for their laxity.

Effectiveness and Specific Benefits

The outcomes of this approach have been tremendously positive. Student actions have changed from passive to active. Thought processes have demonstrated creativity and lateral thinking which is often initially regarded as a frightening experience, but culminates in high levels of self-satisfaction.

Recommendations for improved processes are continually brought to light. Professionally-based personal relationships develop where no relationship would have existed in a traditional course. Group and individual processes as well as communication are enhanced as projects require constant updating and interaction and decision making activity. Individual responsibility becomes a key variable and students understand fully the consequences of their behaviors and hold each other and the professor accountable either explicitly or implicitly.

Interest is constantly high as students have focused upon their weaknesses in designing the individualized course plan and set targets in which they have complete ownership. Resourcefulness develops as students realize that they must find out where, when, and how to gather information and learning materials as well as when, where, and how to develop, study, and complete them. Interest and membership increases in the campus professional organization--Computer Management Society.

The dynamic course structure lends itself to broadening the students capacity to develop sources of information both individually and collectively. Interpersonal and communication skills are enhanced by experiencing information seeking in person, on the phone, and by fax or mail for a specific purpose with which they had a vested interest. Business persons and faculty from other disciplines who generally have no contact with these students were able to interact and develop an

enhanced appreciation for the student's energy and potential.

Experience teaches in a manner which develops intuitive inferences often difficult to verbalize. However, this development activity for enhancing learning by using the TQM methodology in an MIS special topics course has proven to be more valuable than most course design experiences for a variety of reasons.

The students become active participants in the knowledge building process because they gradually become aware that they are *using* the technologies. They realize for the first time that there is a way to gain information extending beyond traditional means which requires thought, insight, courage, and innovation.

They understand that there are no "answer books" for most of their life's work. And they begin to articulate the "missing pieces" and ineffective behaviors related to information and knowledge acquisition. They understand how much more there is to learn than has been acquired. This type of insightful and immediate feedback from students in the traditional courses is seldom achieved.

The students express appreciation for the sense of power they have, for the ability to control their time and schedules to their best advantage, for the opportunity to work with and get to know others in the class, to deepen their understanding or explore new topics of particular interest. They like the opportunity to interact with and to be responsible to outside faculty and/or business professionals. They show excitement about telling others about their experiences in the course and enhancing their resumes by enhancing strengths and overcoming weaknesses.

The above items were taken from an interview given to the campus newspaper by the students in the class. The reporter and photographer observed a portion of the course then asked for feedback as to what or how this course is effective. Other comments were taken from the written mid-term and end of semester evaluations contributed by students who have previously taken the course.

The process focus of TQM has thus transformed into their educational experience an understanding not limited to a subject matter, but including the learning process itself. They are acquainted with not only a variety of information resources for further learning, but also with the type of effort necessary for life-long learning to take place.

It helps provide opportunity for faculty development as the process of learning a myriad of topics conjunctively with students challenges and encourages new thinking. It gives an opportunity for contact with a larger number of information providers and industry people than do traditional methods. This methodology does, however, require more time and better management skills for the professor, but the rewards for the students have been worth the effort. As better and more pervasive electronic methods are adopted campus wide, it is anticipated that "new and improved" methods of teaching and learning will continue to develop. This approach will adapt readily to changing environments and rapid learning processes.

NOTES

Bredemier, M. E. & Greenblat, C. S. "The educational effectiveness of simulation games: a synthesis of findings." Simulation and Games, 1981, 12 (3), 307-331.

Burkhotter, B. B. & Schaer, B. B. "The effect of cognitive style and cognitive learning in a nontraditional educational setting." Educational Research Quarterly, 1984-1985, 9 (4), 12-18.

Carter, G. & Thomas, H. "Dear brown eyes: experiential learning in a project-oriented approach." ELT Journal, 1986, 40 (3).

Duley, J. S. & Permaul, J. S. "Participation in benefits from experiential education." Educational Review, 1984, 65 (3) 18-21.

Dustin. D. L. "Classroom and experiential education." Improving College and University Teaching, 1981, 29 (4), 166-168.

Knowles, M. S. "Contract learning." In Chester Klevins (Ed), Materials and Methods in Continuing Education, Los Angeles: Klevens Publishing Co., 1978.

Kolb, D. A. & Lewis L. H. "Facilitating experiential learning: observation and reflections." In Linda H. Lewis (Ed), Experiential and Simulation Techniques for Teaching Adults, San Francisco: Jossey-Bass, June 1986.

Schiller, S. & Hanks, W. "Experiential learning increases students' job market prospects." Instructional Innovator, March 1984, 19-21.

Shiba, S., Graham, A., & Walden, D. A New American TQM: Four Practical Revolutions In Management, Portland: Productivity Press, 1993.

Specht, P. H. "Experiential learning-based vs. lecture-based discussion: the impact of degree of participation and student characteristics on comprehension and retention." Journal of Business Education, 1985, 60 (7), 283-287.

Faculty as Partners: a Four Tiered Training Approach to the Web

Robin Wagner
Information Resources
Gettysburg College
300 N. Washington St.
Gettysburg, PA 17325
717-337-7030
rowagner@gettysburg.edu

Kim Breighner
Information Resources
Gettysburg College
300 N. Washington St.
Gettysburg, PA 17325
717-337-6932
kbreighn@gettysburg.edu

The phone rings and it's a faculty member. " I'd like to add a technology component to my freshman seminar. I think it's just as important for students to develop good technical skills their freshman year as it is to have an intensive research and writing experience."

Later the same day: "Who can teach Quattro Pro over there? I want my students to know how to do a project using this application."

The list goes on. More calls. More questions.

"What is this Web thing? Is this something I should know something about?"

" I'm thinking of having my students do oral histories. Can they do it on the web? Can we put in pictures of the people they interview? How about sound? I'd love to hear the actual voices."

" I want my students to use census data to do their end-of-the-semester sociology project. We're not a government documents depository, but you can find the same stuff on the Web, can't you?"

"I want my students to submit their papers by e-mail, but I don't want to take class time teaching them how to do this."

"Do you have a handout I can give my students on how to use Netscape and html?"

" I want my students to learn how to find and search the Edgar files so they can have access to company 10K and 9K reports. Can you come over this week?"

"I would like to have my students use technology in some way for my Japanese culture class, any ideas?"

"I heard there are all kinds of great sources in Spanish for current events on the Web. How can I have my students tap into this?"

"My freshmen are all astute computer users but my juniors and seniors don't have a clue. Do you ever run seminars just for upperclassmen to get them up to speed?"

These are but a few samples—all true—of a week's worth (sometimes a day's) of typical faculty requests for training and assistance. At Gettysburg College, the Training Team of Information Resources is not only responsible for working with faculty in this way but also charged with teaching the nuts and bolts of using a wide variety of applications (right down to how do I turn on my computer) to the entire user community. On a typical day this can run from teaching the staff of the President's office how to use a calendar program, training the dining hall staff on Wordperfect and running a seminar for seniors on making a homepage. Our clientele is varied and we have many demands, from administrative offices, staff, and students. The faculty requests, however, are often the most complex because they involve requests where there is often not a quick answer.

They are requests for partnering, for teaching, for turning up new resources and helping with the design of course assignments. They involve the most in terms of time, creativity and planning. And these requests are growing rapidly—too fast. Such requests have forced us to examine training and investigate new models for dealing with this most sophisticated level of question.

As many of you who are in support functions on your campuses are aware, the demand for training and service is not new. We have all seen this growth as proportional to the explosion of resources available in a networked fashion. This runs the gamut from files on the internet to machine-readable versions of once traditional printed indexes of bibliographic material. The demand, coupled with the explosion of possibilities—and interest on the part of our teaching faculty—has begged for new models of teaching and training, and that is what we intend to explore with you today.

At Gettysburg College we are a training staff of three on a campus with 2200 students, 267 faculty, and 29 academic departments. Our network runs throughout the campus and off and connects dorm rooms, fraternities, interest housing, faculty offices, and administrative facilities. We've seen our requests grow enormously in the last year. In addition we're also operating in a somewhat different information resources configuration than what would be considered traditional on most campuses. Two years ago Computing Services (which already encompassed both Academic and Administrative Computing) and Library Services merged to form a new unit—Information Resources. This meant not only blending the two organizations on paper but a physical merger—developing a whole new organization centered around process-based, self-managed teams.

In its present structure, Information Resources is made up of five teams. The team that deals with user education is the Training Team, a combination of software specialists from the old computing structure and bibliographic instruction librarians from the old library structure. Both computer specialists and librarians have had to begin trying on the hat (if not wearing another hat) of colleagues. For instance, as a librarian I have been called upon to teach students to "meet their mac," learn the ins and outs of Wordperfect, format a document, do footnotes, navigate the net and create html documents. My colleague here today, whose anchor was in computing before our merge, has had to bone up in psychology sources when a faculty member teaching Deviance wanted her to help their class create a web page and "oh, by the way, can you teach them to use Psych Abstracts, Social Sciences index, and anything else you think would be a good research tool for their papers." She's had to go and talk with faculty in biology and chemistry about online access to databases most useful in their disciplines. So you see, at the same time that we're running left and right to fulfill needs, we're also having to learn new roles and explore the contents of an unfamiliar toolbox, so to speak.

Add to this the upgrade of all faculty computers (we support both Mac and PC in about equal numbers) in the last year and we had a ready pool of virtual novices, anxious to test the power of their new machine and make good on the president's challenge to make significant inroads toward integrating technology in the curriculum. Now they had the machine to do it!

As I suggested a moment ago, such a palate requires a new model for providing service and that is where we began to restructure the way we do training—to think about alliances and

partnerships which would extend our numbers outside the formal Information Resources structure. One of many ideas we tested this last year was to form stronger faculty partnerships, in a sense, training the faculty to be our trainers, and making them capable enough to handle what we'd call basic training on their own. We did this through a four option menu of training possibilities which included:

-two day intensive seminars generally offered during breaks
-one day blitz workshops offered primarily over breaks or on Fridays
-weekly, 90 minute mini courses offered from 4-5:30 which basically took the components of the two day workshop and one day blitzes and spread the content out in smaller, digestible bits
-and one-on-one training opportunities with clinic support

Our end goal in all cases is to improve the skills of our "first line trainers," the faculty; to up the comfort level so that the faculty feel secure in requiring/teaching basic information technology skills. We are, of course, always willing to come in and do the original demonstration. What it has helped with, primarily, isn't the first contact. We still feel is very important to have IR people are out in the classrooms. Where it has helped us, (and this has become increasingly clear throughout this very experimental year) is in the area of follow up and continued support. Where it lightens the load is in the ongoing support required to not just introduce the technology but work with it all semester long. This is the role we see our faculty assuming—working with their students using the computer to search the web, logging into the online catalog, or searching one of the many information databases from their offices. We teach them the basic navigation now but after one or two intensive sessions, often tailored to their specific assignments, we find our faculty calling less about subject-specific internet related questions and more apt to go out and hunt for resources themselves. Moreover, they often encourage others in their department to become "computer literate" and teach some of those basic navigation skills for us!

Our other agenda is to forge partnerships not only between faculty and IR staff but also with student trainers. We oversee a group of student trainers who staff our drop-in clinic and make themselves available to conduct training for individual students or small groups of students on all of the above mentioned "tools of the trade". Student clinic workers also serve as liaison (we call them student caseworkers) to all of the classes that the Training Team staff assists in. This gives the faculty member and the students in each class not just one contact but two for planning, training, and follow-up help and information purposes.

We have conducted intensive seminars in the use of the web, focussing on the web as both a powerful searching tool and a vehicle for distributing one's own information. To demonstrate the latter point, we use a Training homepage to organize and make available documents from the workshop and actual training materials for our faculty "students" to consult, long after the actual training session ends. We find in classes that we can ask faculty to familiarize themselves with our training pages and at the same time they are learning how to use the web as a tool. They can click on "source" and see the markup tags that created the document—a precursor to what we'll teach them. We can have them navigate around our training pages and by pointing and clicking see how they might create such an electronic document themselves. As trainers, we like the easy update capabilities of having your handouts available in this format. Plus we save trees in the process. You

can access our training pages at the following address:

http://www.gettysburg.edu/~kbreighn/trainteam.html.

These training materials are central to the two day workshop. The syllabus for one such 2-day workshop on Netscape follows:

Day 1
9:00-10:00
Introduction: An overview of basic Web concepts including home pages, links, locations, definitions and hands-on practice with Netscape, our most popular web browser. This introductory session will include demonstrations on exploring the worldwide web, instruction on how to "surf" efficiently and offer strategies for recording the locations of interesting sites.

10-10:15
Break

10:15-12:00
Integrating the Web into the Curriculum: Professors Fender, Arterberry, and Hofman will demonstrate successful projects involving their students and discuss class assignments with Web technology as the centerpiece.

12-1:15
Lunch.

1:15-5:00
Creating Web Documents—The Basics: Begin designing a homepage in this session. Simple instruction offered in hypertext markup language (html) which will show you the basics of creating and tagging documents. Lab and training staff will be available until 5:00 p.m. to assist in construction of individual homepages or further exploration of sources on the Worldwide Web.

Day 2

9-9:15
Review and Questions

9:30-12
Creating Web Documents—Advanced features: Instruction on making links, using color, patterns, scanning pictures and photographs and incorporating other graphic features into your html documents.

12:00-1:00
Lunch.

1:00-5:00
Individual Project Consultations

Open period for creating links, exploring graphic capabilities and discussing individual curriculum ideas. Staff and lab available until 5:00 p.m.

As mentioned earlier, we have also conducted one-day seminars in which we covered the same information in a much more condensed fashion for those people who preferred that method. We have also offered a more "spread out" version, taking this basic course, and dividing it into digestible 1 1/2 hour sessions offered at 4:30. We have discovered that this is a time which suits many of our faculty who don't have the time to devote a day to such an enterprise. With this format we can give assignments and the "students" have lots of play time in between. When we teach the series of three on Netscape, for instance, a typical curriculum would be: First session--What is the web and how do you navigate it. We make stops in our "online" dining hall (which actually lets you see not just the menus but the food that day and the length of the lines!), cruise through our admissions materials and then venture on out on the web, taking requests from the class for things to search using one of the engines. Session two is billed as an opportunity to create one's own homepage, no matter how primitive. The final session teaches use of color, design, layout, tables and more advanced tools to enrich the look and utility of the page. We take them to use the scanner and urge them to bring something graphic to incorporate in their work.

For those who like a handy set of directions close by we have short brochures in a trifold which we distribute. These sessions on Netscape have been so successful that we have introduced a new series of mini-workshops dealing with specific applications. Follow-up is key and to date we haven't found a good method of evaluation. We do solicit feedback via e-mail and ask for suggestions for other courses. Many of the sessions we teach now are an outgrowth of these early Netscape offerings. We find that offering a choice of presentation and format we can cater to a variety of learning styles. Some people want to learn on their own. They can "tune in" to our Web pages online. Others like the intensive approach. All our day workshops are for them. Some like the comraderie that a two day workshop (meals included) offers—sharing suffering amongst colleagues. Others have extremely busy schedules and would like things in measured doses. Our support with student caseworkers makes it all possible when we go from the actual presentation to the ongoing support. These student workers have been key in the continued success of the operation. And finally, we've seen a tremendous increase in faculty teaching each other, or at the very least, engendering enthusiasm amongst colleagues to provide a technological component—and helping their colleagues on the subject-specific side of things. In fact, as you might have observed from above, some of our best faculty "students" volunteer to share their stories at our workshops.

As we said before, our end goal in all cases is to improve the skills of our "first line trainers," the faculty, to up the comfort level so that the faculty feel secure in requiring/teaching basic information technology skills to their students. Our "repeat customers" are shining examples of this—the faculty members that have mastered these skills, gotten their students involved in projects in their classes using these new skills, and also teaching their colleagues these same skills so that they then keep the ball rolling. To view some of the more interesting projects that have come about as a result, check out http://www.gettysburg.edu/newproj.html on the Net.

Supporting Student PCs on the Campus Network

Brad Weaver
Wabash College
Computer Services
301 W. Wabash Ave.
Crawfordsville, IN 47933
voice: 317-361-6308
email: weaverb@wabash.edu

Introduction

In the summer of 1995, Wabash College extended its campus data network, WABnet, to all campus living units. WABnet provides students access to the campus Novell servers, the library catalog, and the Internet. While this connectivity is a great resource for the students, it carries with it a large support load. Intel-based PCs, which come in hundreds of configurations, can be particularly difficult to support. We attempted to minimize the support load for these systems by developing a self-install procedure for student PC connections. This program was very successful, with more than 60% of students connecting without assistance from Computer Services. The paper will discuss student support needs, and the challenges of meeting these needs. Our self-install procedure, which lets students do everything from installing the network card to loading software, will be described in detail. Our ongoing, post-connection support system, which includes a World-Wide Web server and student employees, will also be discussed.

Student Support Needs

In terms of needs, supporting student computers is not much different than supporting PCs in campus computer labs or staff offices. There certainly are additional challenges supporting student systems, but the basic needs are nearly identical. Like a college professor connecting to the network for the first time, a student needs access to an active data port, must install a network adapter, and load connection software and network applications. Once connected, a student will likely require some ongoing support, such as how to upgrade to a new version of Netscape, or what to do if he suddenly cannot connect. Generally some assistance will be required when a student changes rooms, but the same actions would be necessary if our professor changed offices. The primary difference in basic needs is that students will eventually disconnect their systems and move on, whether permanently upon graduation, or temporarily during a summer break.

The difficulty in supporting students is finding a way to meet these needs. A fully deployed student network can suddenly double or triple (or more) the number of computers on the network. It is unlikely that the support staff well enjoy similar growth, so the challenge facing college computer centers is how to "do more with less." The problem is compounded because most students want connected at the same time--as soon as they arrive on campus. Other factors, such as unfamiliar brands of computers, can make student PCs inherently more difficult to support than campus systems.

Making the Initial Connection

Based on experiences at other institutions, we anticipated that the biggest support load would be in helping students make the initial connection to the network, and so our support efforts were focused there. After considering several plans used elsewhere, such as installation fairs and building-by-building mass installation sessions, we decided the best way to minimize our support load would be to have students make the connection themselves. Many students have added sound cards or other devices to their computers, so we thought that, given careful instructions, students could install the network card. Configuring the card and installing client software seemed a bit more challenging, and so would need to be automated as much as possible.

To this end, we designed the WABnet Connection Kit, which is sold through the college bookstore. Each kit includes a network adapter, patch cable, installation software, an installation manual, and a registration form. Several types of kits are sold to meet the needs of different computers; for IBM-compatibles, we sell a version with an Intel EtherExpress Pro card for desktops, and a version with a 3COM EtherLink III PCMCIA card for portables. Most of the work on creating the kits was done by two student interns, who worked on the project throughout the summer of 1995.

The installation manual[1] is a fourteen page guide that describes the connection procedure for both IBM-compatible and Macintosh systems. The guide lists minimum and recommended system configurations, briefly discusses different kinds of computers and what network adapters are needed, and describes the registration process. Four pages are devoted to the most difficult process: installing the network card. The guide then covers the software installation and customization procedures. Finally, the booklet outlines the support options in case a student has problems.

The registration form[2] is used to keep track of who is connecting to the network, and provides us the information needed to prepare the connection, such as which data jack the student will be using, and the ethernet address of his network card. The same form is used when a student makes the initial connection, and when a student changes rooms.

Installation software consists mainly of several DOS batch files which copy NetWare and TCP/IP client software to the student computer, and install application software such as Netscape. Specific tasks performed by these batch files are described below.

The student self-installation procedure is summarized as follows:

1. Student purchases WABnet installation kit in bookstore.

2. Student completes and turns in registration form to Computer Services.

3. Computer Services assigns IP address and enters information into DHCP/bootp server, and activates data port using remote management software.

4. Computer Services notifies student via e-mail that registration has been processed. Processing time is generally 24 hours. Once notified, the student can proceed with installation.

5. Student installs Intel card in any free 8-bit or 16-bit ISA slot, and attaches network cable. The installation guide offers help with this, and a video illustrating the process is also available.

6. Student boots computer, exits Windows, and runs INSTALL program on the installation disk. This batch file installs network access batch files to the C:\BAT directory, installs network drivers to the C:\NET directory, adds the BAT directory to the path, attaches the computer to NetWare server, and calls the WABINSTL batch file, which is located on server.

7. If INSTALL was able to complete all of its tasks, WABINSTL changes WIN command to WINNET in the AUTOEXEC file, copies Windows NetWare client software to the Windows directory, unzips WABnet-ready Internet software (Winsock, Netscape, telnet, ftp, Pegasus Mail) to the C:\WABNET directory, and run Windows, calling Netscape setup program.

8. In addition to installing Netscape, the Netscape setup script was customized to modify the Windows setup to provide NetWare support, connect a network printer to LPT2:, create a WABnet program group, and add Internet applications.

9. The student customizes application software such as Pegasus Mail and Netscape, to include such items as his personal name and e-mail address.

Several steps warrant further discussion. In step 3, Computer Services staff activates the data port, and builds a DHCP/bootp entry for the computer. For security reasons, all data ports in student rooms are disabled using SNMP management software. When a student registers to use a data port, that port is activated remotely. Using this management software, we can control the state of all ports without going to the hub, which saves a great deal of time.

All TCP/IP information (IP address, name servers, etc.) is provided via DHCP/bootp to simplify the connection process. By providing this information via a central server, the student does not need to know (or enter) this information when making the initial connection, nor does he need to change anything when switching rooms. The key piece of information the student must provide is his ethernet address. To make it easier to provide this, we write the address on the outside of the WABnet Connection Kit. It is worth mentioning that the TCP/IP stack included with Windows 95 does not support the bootp protocol, but requires a DHCP server.

The video mentioned in step 5 is a short, ten-minute video produced entirely by our two summer student interns. The video steps through the process of installing the network card--the students open a PC, locate the expansion slots, install the card, and show how to connect the cable. This summer we plan to expand the video to show the software installation, and include some basic troubleshooting tips.

Steps 6 through 8 cover the software installation procedure. From this point on, each step is performed only if the previous step was completed successfully. For example, step 7 involves running a batch file located on the file server; this will run only if the computer made a connection to the server. The key benefit of such a solution is that it is nearly impossible for the student computer to be left unusable or unstable if the installation fails. If problems occur the student will

not have a network connection, but at least his computer will operate as before. This gives the support staff the freedom to schedule visits to student rooms at their convenience, rather than having to react immediately to fix a problem caused by the installation program.

We expected that some students would not want to do the installation themselves under any circumstances, but given the time invested in developing the self-install procedure, we did not want to encourage this. We decided to give the students the option of having Computer Services staff perform the installation, for a nominal fee of $20 (our normal minimum fee for working on non-college systems is $35). With this arrangement, those students who were fearful of opening their computers had a viable way to connect, but the vast majority of students were led to try the self-installation.

Resolving Problems

As mentioned previously, 95% of our students attempted the installation, and for 60% the installation was completely successful. A variety of factors can prevent the process from working. Hardware conflicts between the network adapter and other cards--particularly sound cards--was a common problem. A computer that loads a lot of TSRs to support sound cards, CD-ROMs, and virus protection can suddenly experience memory problems once network drivers are added to the mix. We encountered a third problem because the install program expected the first network drive to connect as F:. If it connected using another drive letter, the install program failed. Another common problem, ironically, was with systems with plug and play (PnP) BIOS. The Intel card is a PnP device, but some PnP systems either configured the card incorrectly, or were unable to manage it.

Students who had installation problems would call or e-mail the student-run help desk. As long as the student installed the network adapter and ran the install program, free support was provided to make the connection. The help desk would go through some basic troubleshooting steps, then arrange for a visit to the student room if the problem could not be resolved. If the student assistants could not correct a problem, it was referred to Computer Services staff. We discovered that most problems required help from professional staff. A more complete discussion of our successes and failures of student employment can be below in the section Residential Networks and Student Employees.

A great advantage of the automatic installation procedure was that it helped to minimize support time, even if the process was unsuccessful. In all but a few cases, students were able to install the network card, so little effort was spent on this time consuming task. Also, support staff could quickly narrow down the cause of the problem by checking to see at which point the installation failed. If, for example, the automatic installation failed to load the network driver, the problem was likely caused by a hardware conflict. Memory and startup file problems have similar key indicators. As little time was wasted finding the causes of problems, they were resolved more quickly. After fixing a problem, support staff simply restarted the installation program at the point it failed.

The biggest problem we had with our automatic installation procedure was caused by Windows 95. Although we had obtained a beta release of this software and tested its networking capabilities throughout the summer, the final version was released only five days before classes started. With the late release, we were unable to develop installation software, or even installation instructions,

for Windows 95 before students started connecting. Because of this, support staff had to manually configure network access for those students who upgraded early in the semester. Basic installation instructions were developed during the fall, but did not have the ease or quality of the Windows 3.1 set. Improving Windows 95 support will be a primary focus of our summer activities.

Continuing Support Offerings

Connecting student computers is almost certain to be the biggest support load, but does not signal the end of the support needs. Some students may develop problems with their connections, and all students will need to update their application software as new versions are released. Computer Services will likely need to get information to students on a regular basis, such as when network maintenance is scheduled or what problems are affecting network access or performance.

The WABnet InfoSource[3], a World-Wide Web server, has been used as a primary source of ongoing support. The main server page contains links to seven areas of information. The News and Notes section is used to list network announcements, down times, and trouble reports. The General Information page discusses the features and benefits of WABnet, contains usage guidelines, and offers an overview of the network. WABnet Support Information tells how to connect, disconnect, and everything in between. The ever popular WABnet File Archives section provides a local download source for popular software, and also contains links to off-site repositories. The Expansion Page was used to provide updates on the progress of the network expansion to the dormitories; now that the expansion is finished, this section will soon move to the General Information or News and Notes section. We maintain a list of networking resources at other institutions, as well as home pages of the companies whose products are used for WABnet, on the Links to Interesting Places page. Finally, the Telephone Information page is a source for a variety of information about our campus telephone system.

Maintaining a web site is a time consuming undertaking, but worthwhile. Providing a one-stop resource for all networking information lets users find help easily; perhaps while browsing they will find something else they can use, but never thought of. The Web can be used to distribute announcements, support information, and file updates. It allows easy access to off-site resources, such as computer vendors or software companies. The Web even provides an easy way to getting information from the user, through the use of forms. Also, having an Internet-based support site allows users around the world (including prospective students) to see what is available at the college.

Continuing problems were resolved as initial connection problems were. A student having trouble would call the help desk, and the problem would be filtered up the support chain until resolved.

Leaving the Network

Sooner or later, all student computers will leave the network and be used again as stand-alone systems. For many students this may occur twice or more each year. Two objectives are important in these instances. First, as much as possible the student computer needs to be restored to the state it was before connection. Probably connection and application software should not be deleted from the hard drive, but network drivers should not be loaded, nor should the student be bombarded with warning messages that a network was not found. The second, sometimes competing objective, is

that the system must be easily reconnected to the network when brought back to campus.

Support Challenges

Many factors can make supporting student-owned PCs more challenging than supporting computers in college computer labs or faculty offices. Understanding, and overcoming, these challenges is essential to providing effective support. The primary difficulty is likely to be supporting the wide range of brands and models that students own. Further problems can arise from the unusual configurations, such as multimedia systems or different operating systems, that many students have. Ongoing support is complicated because support personnel have no control, or even influence, over how systems are modified or upgraded. Students change rooms, which requires action by the network manager. Finally, supporting systems in a different environment--the student dorm room--is a challenge itself.

The wide range of computer brands and models provides the biggest challenge in supporting student-owned PCs. At Wabash, we can dictate that all college-owned PCs are of a particular brand. With this arrangement we become very familiar with the hardware and software intricacies of that brand, and our support load is minimized. We do not enjoy this luxury with student computers, however. Instead of supporting one brand, we are supporting more than twenty name brands, plus many nameless clones or homemade systems. This presents many difficulties to those supporting student systems.

Unfortunately, the range of brands is only half the problem. Student computers have an incredible range of configurations. Some students have slow, underpowered "hand-me-down" systems, which were sent to school when the family PC was upgraded. Other students have high powered multimedia systems, complete with tape backup, zip drives, surround sound speakers, and video capture boards. Support personnel must be able to providing functional network connectivity on all types of systems--a prospect which can be as difficult on loaded 133mhz pentium systems as on 386SX computers with 4mb RAM and 40MB hard drives.

Other challenges arise from not having control over student systems. For college systems, we can reasonably dictate what peripherals and additional hardware can be installed, which operating systems are used, and which application software will be supported. With student systems, we lose this control. A student may decide to install a new sound card or zip drive, download a beta release of Netscape, or upgrade to Windows 95. Often these changes affect network access.

At Wabash many students, particularly freshmen in fraternities, may change rooms frequently. Each time a student moves, his old network port must be disabled, and the new port activated. If the student changes buildings, his IP address information must be updated as well. While these changes are not insignificant, the time requirement is not substantial. Student movement is currently tracked using the WABnet Registration Form; next year we hope to allow students to report a move via a Web form.

The environment of student PCs creates a special set of challenges. One problem is location. At Wabash, like many schools, student living units are located at the outer edges of the campus. Support staff may spend significant time just in going to and from student housing. After reaching

a building, working on a computer in a student room can be challenging. Cluttered rooms, pets, roommates, noise, and lofts can create undesirable working conditions--trying to diagnose a problem while dogs are yapping, music is blaring, or roommates are fighting is problematic, to say the least.

Overcoming the Support Challenges

In our support policies we have tried to adapt to the student environment, rather than dictate what is acceptable for student systems. Nevertheless, some controls are necessary to ensure that student needs are met; there is, after all, a limit to how much time can be spent connecting student computers. Such controls needed to simplify our support, while allowing students as much flexibility as possible.

One firm requirement is that all students must purchase a WABnet Connection Kit to receive any support. In a few isolated incidents, a student purchased a different network card or owned a PC with a built-in network adapter. We allowed the connection but would not offer any help with installation; in all but one case the student ended up purchasing a kit from the college. Also, we have limited support to DOS, Windows 3.x and Windows 95 systems. A number of students run Linux, but depend on each other for support. Finally, we do not support beta software releases. Beta releases are problematic particularly with Internet access software such as Netscape, because they are readily available, but are not always stable.

There is no easy way to overcome the problems caused by different brands and configurations of student computers. Only time and experience will address this. The best way to minimize this problem is for support staff to document (and communicate to others) the solutions to problems. All problems are likely to be repeated, and there is nothing more frustrating than having one support student tell another about a problem, only to be told that the second person had seen the same thing only two days earlier! In some cases, support staff may need to refer the student to the system manufacturer for assistance. We had one case where we could not get a Windows 95 system to recognize the sound card once the network adapter was installed, even though the two boards had no hardware conflicts. The vendor quickly told the student that under such a configuration, a different sound driver had to be installed. This and similar problems are virtually impossible for support staff to solve without vendor support. Ultimately, if a problem cannot be resolved, support staff must be empowered to tell a student that the computer simply cannot be connected, given its current configuration. Hopefully in these situations the support staff can at least give the student some options for connection (such as removing that odd answering machine board that uses four interrupts).

One problem we did not handle well was getting caught up in general student PC support. Many students seem to be of the opinion that once they connect their computer to the campus network, the college will provide free, immediate, and effective service for any problem they might encounter, whether or not the problem is related to the WABnet connection. Hardware upgrades can cause interrupt conflicts. Installing games and other software can overwrite the AUTOEXEC.BAT file, modify Windows settings, or cause RAM shortage. Upgrading operating system software can mean nothing works. Such system changes very well may affect network access or performance, but is this a network problem? Usually not.

This problem has led us to modify our support policies for the coming school year. We will continue to provide free support to establish the initial connection (provided the student has installed his network card). We will also offer free support during the first week or two of connection, in case the student discovers any problems that were missed during the setup. However, after the initial free support period, any student needing assistance will be required to bring his system to us, and pay for support.

Residential Networks and Student Employees

Residential Computer Consultants (RCCs), students hired to help support the student network, were a critical part of our initial support plans. During the fall semester we employed ten RCCs. These students ran the help desk, answering trouble calls and e-mail, and worked on problems on-site.

We discovered early in the semester that the RCCs were able to solve few of the problems students were having. There were probably several reasons for this. The primary reason was that many of the problems which caused the automatic installation to fail, such as hardware conflicts or memory issues, were difficult to solve, and beyond many of the RCCs' technical abilities. Training was complicated by having so many RCCs; it was also hard to justify extensive training of students who worked only five or ten hours per week. In the end, we realized that the systems the RCCs could help with were being set up without help by the students themselves. In this respect, the self-install procedure was working too well!

For the spring semester, only two students were hired as RCCs (first semester RCCs were rehired as computer lab operators). With only two RCCs, these students were able to work more closely with Computer Services, and were trained to solve more difficult problems. The students also took on some of the maintenance tasks of the WABnet InfoSource web server, which gave them something productive to do during periods of low support needs. We plan to continue with this model next year.

Conclusions

One year into residential network connectivity at Wabash, we are convinced that student PCs can be supported, with reasonable impact on support staff. Our self-install procedure has worked very well; by incorporating into our procedures what we have learned this year, we hope to raise the success rate to over 75% next year. We are also very pleased with the success of the WABnet InfoSource, and will develop and promote this resource even more heavily next year. Finally, by refining our student employment, we will be able to shift even more support away from professional staff.

NOTES

1. The complete installation booklet is available in Adobe Acrobat (.PDF) on the Internet at http://jade.wabash.edu/wabnet/support/instalgd.pdf
2. The complete registration form is available in Adobe Acrobat (.PDF) on the Internet at http://jade.wabash.edu/wabnet/support/regform.pdf
3. The WABnet InfoSource is open to all Internet users, and can be found at http://jade.wabash.edu

The Compressed Video Experience

John Weber
Director of Computer Services
Southern Arkansas University
Magnolia, Arkansas 71753
Telephone: (501) 235-4083
E-mail: JWEBER@SAUMAG.EDU

In the fall semester 1995, Southern Arkansas University-Magnolia (SAU-M) began a two semester trial delivering college classes via a compressed video link between SAU-M and our sister school Southern Arkansas University Tech (SAU-T) in Camden. Each compressed video unit manufactured by VTEL Corporation of Austin, Texas (www.timetool.com/) consists of two 25 inch television monitors mounted side by side on a mobile stand, stereo speakers, a user controlled movable camera, a fixed document stand camera, and a number of directional microphones all controlled by a 486 microcomputer processor. The remote classroom is displayed on the left monitor and the home classroom is displayed on the right. The faculty member controls the video unit with a control tablet using a magnetic pen and a computer keyboard connected to the microcomputer processor. Communication between the two compressed video units is by a one-quarter T-1 (384 kilobyte transmission rate) dedicated telephone line. Compressed video is not full motion video like that seen on commercial television. The signal from the sending unit is processed by the microcomputer software into a smaller package and transmitted to the receiving unit where it is processed again into a full picture. As a result of this processing and delays due to traffic on public telephone lines, the picture is occasionally 'jerky' and parts of the audio are lost. This 'jerkiness' does not effect the quality of the reception and within a short period of time viewers learn to ignore these minor interruptions. In extremely rare instances, a sentence or paragraph may have to be repeated.

The two compressed video units, the one-quarter T-1 telephone connection, installation, and maintenance were provided free of charge by Southwestern Bell Telephone for the trial period. SAU-M and SAU-T had only to provide a suitable room and assist with the installation of the units into the institution telephone system. The units were installed at SAU-M and SAU-T in the summer of 1995. Classes taught via compressed video between SAU-M and SAU-T include Unix, intermediate algebra, data structures, maintenance technology, C programming, and elementary school curriculum.

As soon as we began broadcasting and receiving classes, we discovered that using the compressed video as a single medium of delivering distance education is not as effective as was first hoped. As a result of our experiences with this trial period of distance education via compressed video, we developed a concept of an Electronic Classroom. The Electronic Classroom envisioned would include the compressed video unit connected to the University campus network, a fax machine, photocopy machine, high quality speaker telephone, video tape machine attached to the compressed video unit, a microcomputer connected to the University network, and a printing electronic white board. Each student would have access to the internet and have an e-mail account and access to list serve software for a particular class.

The cost of a suitably equipped compressed video unit is approximately $80,000.00. In addition, the cost of a microcomputer, network connections, fax machine, photocopy machine, speaker telephone, electronic white board, furniture, modifications of the room for better acoustics and lighting, and other support services would increase the total cost of an Electronic Classroom to almost $100,000.00. Telephone line charges will vary widely depending on the tariff rates of local and long distance providers. The cost to SAU-M to establish a permanent T-1 telephone line for compressed video would be approximately $1,200.00 per month. Even though a compressed video connection requires only a one quarter T-1 line, Southwestern Bell Telephone Company will install only a full T-1 line and SAU-M will be required to pay the full T-1 rate. However, since each compressed video unit uses only one-quarter of a T-1, three additional units could be added in the future using the same T-1 line with only a small line charge increase.

As a result of organizing, administering, and delivering these classes, a number of issues arose that were unique to this medium of delivery of education.

Administrative Issues:

Remote registration: Procedures had to be changed so that students could register from either of the remote sites. This included having the necessary forms in each office of the registrar and training registrar staff to be able to help students register for classes at the remote school. The completed forms then had to be forwarded to the opposite school registrar's office.

Tuition, fees, and credits: It was decided that the school that broadcast the course would receive the credits for each student who registered for that class. Also, students would pay the prevailing tuition and fees of the school where the course originated. Where a course was team taught with faculty from both SAU-M and SAU-T students at each site would register with the home school.

Financial aid: Procedures for coordinating student financial aid will have to be developed since the total student course load would be spread between two separate institutions. This was not a problem with SAU-M and SAU-T since we are, technically, the same institution. However, in the future as the compressed video network matures, a full-time student could be taking classes at two or more institutions; even schools located in different states. A great deal of effort will be required to coordinate student financial aid especially Pell awards and student loans.

Articulation agreements, credits, and course numbers: Students must be assured that the classes they are taking via compressed video will transfer between the schools in the video link and to other institutions. Articulation agreements which include prerequisite and corequisite courses, number of credits, course description, course numbers, and course equivalents must be made in advance between participating institutions and publicized for each class.

Grading systems: Grading systems will have to be standardized or agreements that establish grade translations between schools will have to created for compressed

video courses. For example, SAU-T gives only pass/fail grades for intermediate algebra while SAU-M assigns letter grades for the same course. Where there was a difference in a grading, it was decided that students with a majority of hours at SAU-M would receive letter grades and those who had a majority of hours at SAU-T would receive the pass/fail grade.

Advising: Advisors at each school must be informed about the advantages and disadvantages of taking classes by compressed video and of the procedures needed for students to register for these classes. Short training sessions discussing and demonstrating the medium should be scheduled with advisors so they can help students make good decisions whether to take a compressed video class or not.

Credits in escrow: One of the future uses of the compressed video links will be to offer college level or remedial classes to local high schools. A system must be developed with each high school district concerning the credits their high school students may earn.

School calendars and class time schedules: The SAU-M and SAU-T school calendars are different. At the beginning of each semester, SAU-T students attended classes three days before SAU-M students started. Also, there was a difference in the starting times of class meetings. At SAU-T, the classes start at ten minutes after the hour and at SAU-M the classes begin on the hour. Each class that was to meet via compressed video established a starting time convenient with students and faculty. If the compressed video link is to be permanent an agreement must be made to standardize the school calendar and start of class meeting times.

High school class scheduling: Scheduling college classes to be broadcast to local high schools is even more difficult than scheduling classes between colleges. Most college classes do not meet every day; almost all high school classes do. High school class meeting times run to the minute on a strict bell schedule and are far less flexible than college class meeting times which may vary considerably. Also the yearly college calendar has many more days of vacation than the high school calendar.

Books and materials: A method will have to be developed between the bookstores so that books and other required class materials would be available and could be purchased at each site.

Academic Issues:

Faculty training and skill level: Training to competently and confidently use the compressed video unit and the other equipment such as the fax machine, networked PC, and e-mail is critical. To teach well in the Electronic Classroom a faculty member must have the technological skills and confidence to use all of the various electronic devices. The faculty members who have shown the most interest in the medium tend to be those who are most technologically experienced and need only a few hours of training. Others who have less experience with technology will require

many hours of training to be able to effectively handle the equipment and teach well using it.

Communication between faculty and student: Since students and faculty are many miles apart, a new form of faculty office hours is needed. Each student and faculty member should have an e-mail account for direct, fast communication. Also faculty members may wish to moderate an internet list serve for students in each class for additional group discussion outside of regularly scheduled classes. A World Wide Web page could be created also that students could access and faculty could post materials for class use.

Alternating sites: Several faculty have found that alternating sites a few times during the semester, especially at the beginning of the semester, improves the relationship between the faculty member and students at the remote site. Even though students can be seen and heard through the compressed video link, the important personal contact between instructor and student that is missing can be established this way.

Changing instructional paradigms: The manner in which class information is delivered by the faculty member will have to change. Compressed video does not work well broadcasting information delivered by lecture. It does lend itself well to multimedia presentations.

Modification of materials for the medium: Materials used in class such as printed handouts, photographs, video and sound recordings, and computer presentations may have to be modified for use with the compressed video unit. The compressed video unit is designed as a multimedia device, however. The unit is run from a microcomputer processor that can be connected to the University network, a video tape recorder can be included, and video slides can be stored and manipulated electronically. The unit also has a fixed document stand where printed materials can be displayed.

Intellectual ownership of class materials: Classes are video taped as part of disaster recovery in case the connection was lost for a particular class. At issue is who owns the rights to that particular class broadcast, how long will the recording be available, and who will have access to the recording.

Copyrights on materials broadcast: Laws describing limitations and responsibilities of copyrighted material broadcast to a remote site via compressed video are not clear. Since this is a new medium, copyright issues and what constitutes fair use has not been well defined. A reasonable solution will be to use the same parameters used for copying and distributing printed materials until the issue can be clarified.

Release time or additional salary for class preparation: Some faculty who would like to teach via compressed video request either release time or additional salary because of the additional time to learn to use the technology and prepare materials for a class. During this testing period, those who taught compressed video classes volunteered

to do so without extra compensation. This issue is yet not resolved at either SAU-M or SAU-T.

Diction of the instructor: The ability of the instructor to project his or her voice and articulate clearly is essential. Some speakers due to their manner of speaking cannot be easily understood at remote sites because of the quality of the sound transmission. Better acoustics, additional speakers, and the creation of an external sound system improves this situation.

Procedural Issues:

Site coordinator: A site coordinator is needed at each remote site to handle day to day administrative tasks. These would include scheduling the room, booting the video unit, solving minor equipment problems, reporting malfunctioning equipment and assisting students with academic and administrative problems associated with the compressed video class.

Classroom management: Depending on the educational content of the class and demographics of the students, classroom management may be required all or part of the time. Classroom management will including monitoring tests, collecting and distributing assignments and printed material, and communicating with the faculty at the remote site. When broadcasting to a high school location, a classroom manager will have to perform the administrative tasks required of teachers of any class offered at that high school as well as the tasks required by the compressed video format.

Backups in case of line failure: Backup capabilities are required in case of loss of the video link. A video tape recorder can be connected to the compressed video unit to record each class and the tape sent to a site that lost the connection. Also, an excellent quality speaker telephone could be used to establish an audio link if the video link is lost.

Transportation of materials between sites: A process where class materials such as tests, assignments, handouts etc. can be transported between sites in a timely and reliable manner is needed. During the trial period, transportation of documents between sites was done by a faculty member who taught classes at both schools and made three trips per week between SAU-M and SAU-T.

Physical Issues:

Hardware and software maintenance: The success of the electronic classroom will depend upon all of the various electronic devices working at all times. All electronic devices will require periodic maintenance, hardware and software upgrades, and repair at times. Provisions must be made for quality technical support and repair services with quick turn around times. The site coordinator and/or the classroom manager must be able to perform routine maintenance and trouble shooting tasks.

Physical room arrangements: The acoustics of the room are extremely important. Ideally, the room used for compressed video is smaller than the usual classroom, and will need sound absorbing materials such as carpeting, drapes, and ceilings to eliminate echoes. The color of the carpet, walls, and any sound absorbing fabric effects the quality of picture seen at the remote site. Lighter colored pastel shades work well as do neutral colors. Dark and sharply contrasting colors tend to make the picture at the remote site too dark.

Class Size and furniture arrangement: The number of students in the class who can effectively see detail on the video screen is usually 15 or less. Larger groups can be accommodated, but as students sit further away from the screen detail is lost and smaller lettering can't be read. Students sitting in rows in the traditional classroom arrangement does not work well. A better solution is to have tables and chairs in an open space that can be arranged for best viewing depending on the needs of the class.

Scheduling the room: A room must be found that can be dedicated exclusively as an electronic classroom. Some of the classes offered between SAU-M and SAU-T meet only once per week. Canceling the class because the room is needed for some other use is a significant loss of class time.

Summary:

The financial strategy of SAU-M will be to fund the large amount of capital needed with grants and fund the day to day overhead costs from the normal University budget. The academic strategy will be to receive remedial classes from SAU-T, nursing and medical classes from the Arkansas state Telemedicine network and possibly graduate programs that SAU-M does not have from another senior institution. SAU-M will broadcast college credit classes to several local high schools and third and fourth year level courses to SAU-T so that the SAU-T two year students can complete four year degrees.

Instituting a compressed video classroom is enormously expensive, requires substantial administrative coordination between educational institutions, and significant efforts and training on the part of faculty to deliver quality education. In spite of these limitations, compressed video has great potential to deliver and receive educational programs to and from remote sites.

Integrating Courses with The Internet
Preparing the Teacher as well as the Learner

Arthur E. Williams, Ph. D.
Division of Art & Letters
University of Maine at Machias
9 O'Brien Avenue
Machias, ME 04654
207 255-3313, x357
awilliam@acad.umm.maine.edu

Introduction

Most colleges and universities have Internet connections that provide students and faculty with access to the world, giving them electronic mail, gopher and World Wide Web resources, newsgroups, chat services, and the ability to download software, text and graphic information. The challenge for the instructor and the computer administrator is integrating these resources into the curriculum. This presentation will present integration methods that have worked and help the administrator make this job easier for the instructor.

I teach speech and theatre at a small New England university. Technology has been emphasized there since the early eighties, when a series of grants helped create student computer labs and put computers in faculty offices. We now have about forty lab computers available for student use, with a computer for every faculty member. The machines are networked, and this summer will see an infusion of Pentium and Power Macs connected by Novell. Every student and faculty member has an e-mail address, and we all have access to the Internet via Gopher, Lynx, or Netscape. We have three classrooms that are linked to the Educational Network of Maine, which furnishes interactive distance learning to the state. One of those rooms has the facilities to originate ITV classes.

In short, we have been in a position to use technology for about ten years. Some instructors have embraced these new teaching tools, and some have tolerated computers in their offices. Some students love the chance to do their research over the Internet, and some moan audibly when an assignment involves a computer. Bringing technology into the classroom has been challenging yet rewarding. It is a process involving a great deal of hard work and frustration, but ultimately, it can augment the quality of the classroom experience.

Slipping into the Shallows

Steve Gilbert, of the American Association of Higher Education, differentiates technology use in several ways, one of which is whether it is "shallow" or "deep." An example of shallow usage would be using computer projection in a standard lecture in place of overheads, whereas deep usage would be a total re-thinking of the teaching/learning process utilizing technological assets. Both are valuable, and the instructor who wants to dive into deep usage often finds some shallow experience

is an asset to course development.[3]

Since technology went from a dream to a promise, the prospect of revolutionary change has been on the horizon. It has largely stayed on the horizon, with the revolution giving way to a more gradual evolutionary change. One significant change is the passing of educational technology from early pioneers to the mainstream. E-mail and the Web are bringing technology into the classroom. These incursions are less than dramatic, as many instructors first use technology in much the same way they would use older resources. These might include, as mentioned above, using computer graphics in a standard lecture, incorporating e-mail to enhance teacher-student communications, or teaching a course over interactive television. Although these early techniques might strike one as incremental, they lead to improvements in teaching and learning.[4]

One of the most influential technologies was electronic mail. Faculty have used it to allow students to ask more questions, overcome shyness, and generally increase participation. Although some faculty notice an increase in workload, the change brings with it increased interaction (better both in quantity and quality) with students.[5] I have been using e-mail for several years in my courses in public speaking, communications, and dramatic art. Students in these classes are required to use e-mail at least once in the semester, and they are encouraged to hand in assignments electronically. The time between assignment and correction is radically shorter than it is with paper and ink, and my students make additional efforts to redo and re-submit work, knowing that they will receive corrections within a day or so, but more often within the hour. E-mail also helps foster interaction, as students frequently are freer with comments than they would be in person.

This past year I have encouraged my students to do more of their research over the Internet. Our library is small, and frequently students find that it does not have the resources they need. Since my public speaking class involves a research component, my students this year had to go on a "Treasure Hunt," which involved finding information using Lynx and Netscape. A combination of lecture, demonstration, and peer instruction helped introduce them to the Internet. Although there were still groans, many discovered an exciting research tool that they continue to use to augment their presentations.[6]

Going the Distance

The new technology is also giving new life to distance education, with interactive video being supplemented with bulletin boards, listservs, and web pages. This sort of interaction has not yet advanced to the point where it can substitute for the traditional classroom experience, nor is it

[3]Steve Gilbert, "Making the Most of a Slow Revolution," *Change*, 28, no. 2 (March/April 1996), pp. 10-12.

[4]Gilbert, p. 10.

[5]Gilbert, p. 12.

[6]http://130.111.175.15/Home/Techno-Teaching/WebHunt.html

anticipated to do so. However, the classroom continues to lumber toward change. "Virtual Universities" are being proposed and followed through. Technology is also used to push productivity gains, forcing universities to serve a larger and more varied population with fewer resources. Technology is thus dual-edged, creating more options while facilitating (in the legislative mind, at least) the reduction of the faculty workforce.[7]

The Western Cooperative for Educational Telecommunications has developed a set of "Principles of Good Practice for Electronically Offered Academic Degree and Certificate Programs." Dealing primarily with distance education programs, these principles are designed to ensure quality education over electronic channels. They state that programs should be rigorous and complete, allowing meaningful interaction with qualified faculty. The program should follow the mission of the transmitting institution. The faculty teaching in such programs will be trained and supported, and appropriate resources will be available to all students. The demands of the program on the student will be clearly stated and available to all students. Finally, the program shall be evaluated on a regular basis to ensure quality[8].

In teaching Public Speaking over interactive television, I found the computer in general and Microsoft Powerpoint in particular to be a godsend. The sizable amount of lecture material needed for this course would have been confusing at best and unintelligible at least had it been delivered using a blackboard. Powerpoint made computer-generated slides, primarily text, with an occasional graphic, easy to produce. When transmitted and matted with my live image, the lecture improved considerably in reaching the class members. The precision of the computer imagery adds a lot to the effectiveness of the presentation.

Seeing the Big Picture

Whether the lecture is over a distance or in a traditional classroom, difficult concepts can become clearer when visual examples are there for the student's edification. For example, when Watson and Crick were developing their model of the DNA molecule, a tabletop model helped them to see the peculiar geometry of the double helix.

Computer software has advanced to the point that visual presentations that were once the province of either artists or complex programmers are now easily available. For example, in science and engineering, tools such as Mathematica or Silicon Graphics' FAST give equations a form, a shape that the student can instantly perceive. The Internet is an excellent source of visual data, as the net-savvy student or instructor can download any graphic from anywhere in the world.

Of course, the graphic is only as good as its user, and accurate and meaningful representation works best when collaboration across disciplines leads to interaction between engineers and artists. It is often advantageous to involve the student in the process as well. Thus in a lab situation, the pairing

[7]Gilbert, pp. 12-13.

[8]Sally M. Johnstrone and Barbara Krauth, "The Virtual University: Principles of Good Practice." *Change*, 28, no. 2 (March/April 1996), 38-41.

of the scientist and the artist can lead to a symbiotic relationship, which, under the proper guidance, can lead to results far beyond what either could have achieved alone.[9]

Learning to Surf

Outside the classroom, students and faculty both need to engage in meaningful research. This has traditionally taken place in the campus libraries and laboratories. The advent of the Internet has removed physical location as a consideration. From computer labs to offices to dorm rooms, students and faculty are surfing the net in pursuit of knowledge. Unfortunately, the Web is inherently anarchic, and finding meaningful information can be challenging. A well though-out program of instruction can ease the transition to technology-based learning.

The changing nature of the Internet makes navigation a challenge. The UWired program at the University of Washington is an attempt to bring navigation tools and skills within reach of the average student. It targeted three groups of incoming freshmen for intensive technology instruction. With corporate support from Apple and Microsoft, the project began in the summer of 1994.

Faculty and staff for the project took five days for intensive training in information access, integrating Internet resources into both upper and lower division courses, using e-mail for class instruction, use of the UW library resources, and using commercial software in classes.

The student training emphasized collaborative learning with study groups and co-authored assignments. Students took a two credit seminar in Information and Technology, which was taught by librarians. The seminar emphasized cross-curricular skills which could translate across disciplines and skill levels. Seminars were taught in a special classroom with Ethernet and power connections.

The program received high ratings. Not only were students willing to take similar courses, but instructors noted significant differences in their abilities to access information and their engagement in the learning process. General scores were higher, as were library abilities. Other factors that enhanced the program were the emphasis on collaboration and the portability of the Powerbooks.[10]

The UWired model shows that a well-planned and officially sanctioned program can work in integrating technology into students' lives. What is even more important is to give faculty a firm footing in these new techniques. For a variety of reasons, academe changes more slowly than industry. Time demands, resource limitations, and a reluctance to abandon tried-and-true techniques stretches transition time. Faculty need to see a clear benefit to change their teaching styles and methods. Last year, our computer manager held a workshop to introduce faculty to Internet resources. They had fun sending e-mail, finding recipes on the Gopher, and browsing the various groups. Unfortunately, the trivial nature of *alt.alien.vampire.flonk.flonk.flonk* and other groups led

[9]Steven Aukstakalnis and Wm. Michael Mott, "Transforming Teaching and Learning through Visualization." *Syllabus*, 9, no. 6 (March 1996), 14-16.

[10]Louis Fox, and Kathryn Sharpe, "UWired: Drivers' Ed for the Information Highway," *Educators' Technology Exchange* 3, no. 2 (Fall 1995), 18-24.

most of them to conclude that this was a cute toy that would never replace a couple of hours in a good old-fashioned musty library.

Jumping into the Deep End

Education is changing to make learning more active, less authority-driven. Technology assists active learning, but teaching method need to change. For example, lecturing may prove less effective than facilitation exercises. Where once a faculty member was the gatekeeper to knowledge, now Information Age technology gives every student access to vast oceans of information. Both students and faculty must become masters of "Information literacy." As defined by C. S. Doyle, one who is information-literate can "identify a problem, recognize the need for accurate and complete information to make decisions, ask questions based on information needs, develop search strategies, access and evaluate information, organize and integrate information, and use it in critical thinking and problem solving." The change involves the sheer amount of data which is out there and easily available. For many faculty, keeping up with the technology that opens these floodgates is a major effort. Add to that anxiety about the entire process and many faculty will find themselves deciding that changing their curriculum just isn't worth the time.[11]

What are the issues that keep faculty from adapting? Fear of change, fear of the time involved, fear of appearing incompetent, fear of technobabble, fear of failure, not knowing where to start, fear of making a bad choice, fear of typing, and fear of rejection or reprisal are only the short list of reasons for holding back. How can we shift perspectives?

First of all, faculty must be realistic: Technology is not going away, and no *sabot* will stop its advance. Learning this will involve time and effort, but the longer one waits the harder the change will be. Secondly, faculty must decide who's boss: deciding what they want to accomplish in terms of their teaching and course objectives, then trying to fit the technology in place. Faculty must avoid trying to fit things in because they are available. If they ease into it, they can build on experience. It will help them to become familiar with the culture: there are catalogs, conferences, workshops and local training. These facilities are available. Faculty should use them.[12]

The individual faculty member can do a great deal by using his or her own resources. Play is often dismissed as intrinsically unworthy, but it is a wonderful learning tool. Faculty can practice and experiment on personal terms, on their own time. It also helps to draw on peers. On most campuses, there have been faculty members who have leaped into technology, learning it on their own and bringing it into their classrooms. If the techno-neophyte is able to network, he or she will find that there will be others who know how this stuff works. My advice is this: Let your hand be held. Ask questions. Arrange times to work with the others. Share disasters and conundrums as well as triumphs. Of course, those who are familiar with the technology must be willing to help. Finally,

[11]LeAnne H. Rutherford and Sheryl J. Grana, "Retrofitting Academe: Adapting Faculty Attitudes and Practices to Technology," *Technological Horizons in Education Journal*, 23, no. 2 (September 1995), 82-83.

[12]Rutherford and Grana, p. 83.

acknowledge that one of best resources for use of technology is already in the classroom: your students. Reverse roles: don't be afraid to learn from your students. Experiment by letting them suggest ways to incorporate technology into your class.[13]

One of the major shifts in the teaching and learning process has been a decentralization in the classroom, with instructors shifting from presenters of information to facilitators. Technology is not vital to make this changeover, but it helps. For example, a faculty member may roam the computer lab assisting students as needed, but seldom does any lecturing. Unfortunately, the change may be coming at a rate that is far faster than we anticipate. Many students come into the classroom knowing how to surf the net, plucking content off computers far easier than the instructors. The lack of organization and quality control, in short, the basic anarchy of the Internet makes its integration into the classroom difficult.[14]

Caught in the Web

The Internet is developing its own culture. As ARPANET, it originated as a tool for a relatively small and elite group of educators, scientists, and professionals. It has since exploded in all directions, bringing people who are comfortable with technology and their computers, but are new on line and those who are complete novices to the computer experience. Newsgroups which may have proceeded at a stately 30 to 40 postings per day are now flooded with ten times the amount of participants. This flooding has led to domain snobbery: long time users look down their noses at correspondents from "aol.com."[15]

This explosion has also found its way onto the World Wide Web. There is a great deal of content but no assurances of quality or relevance. Many pages are from corporations trying to sell us products with fancy graphics and skimpy content, some are simply "shovelware" with lots of content but no consideration for the design and usage demands of the Web medium.

The faculty member who wants to utilize the Web soon finds out that it is a demanding job on many levels. Working with HTML is programming, and it is as unforgiving as any other computer language. The process can be lengthy and painstaking. Programs such as PageMill offer alternatives to hand-coding, but many features still have to be entered line by line. Secondly, a good web page uses graphics effectively. One can no longer just consider the verbal explanation of concepts but their visualization as well. Audio, video, forms, clickmaps, and CGI functions make alliances with a dedicated programmer not just desirous but a necessity.[16]

---

[13]Rutherford and Grana, pp. 83-86

[14]Trent Batson and Randy Bass, "Teaching Learning in the Computer Age," *Change*, 28, no. 2 (March/April 1996), 42-44.

[15]Danny Goodman, "Education and the Internet: The Coming Challenge to Internet Culture," *Syllabus* 9, no. 3 (November/December 1995), 10.

[16]Goodman, 11.

I have found web pages for individual classes to be extremely helpful. This past semester, my *Studies in Drama* course examined the metamorphoses works undergo as they change from medium to medium. For example, *Phantom of the Opera* began as a newspaper serial, was adopted as a classic silent film, and is currently on Broadway as a blockbuster musical. The resources for this course are centered on the class web page. The page contains links to articles, graphics, and fiction. The changeable quality of the web also allows for quick changes in the class. Some of the assignments were determined by the class, so when they decided to examine the Who's *Tommy*, the page was able to link to the many pages celebrating this work.[17]

The technology will continue to change, and interactivity will continue to increase, as will customization. For example, browsers may be customized to meet a class's needs. Teaching on the web will mean changing content and appearance on a regular basis to fit student expectations of Web content. It will also mean an increasing need for the instructor to learn and adapt.

Web pages and discussion groups change on a regular basis. This plasticity of resource leads to a different consideration of resource material. Books have a finished quality, a permanence that engenders (rightly or wrongly) a sense of trust. Electronic resources, by being in a constant state of flux, make creation clearer as a process. [18] I find this sort of change exciting. It allows for a change in traditional pedagogy and encourages a re-examination of the teaching process. One of the major benefits I received from teaching over the distance education system was that it forced me to take a good look at what I do in the classroom. Techniques that work fine face-to-face aren't always effective over the airways. On the other hand, techniques developed to engage the distance-education student often improve the interaction in the traditional classroom.

Conclusion

Technology promises to add to the process of teaching and learning. As faculty, we must be able to make the best use of computers, the Internet, and all of these resources. There is nothing wrong with starting out slowly: computer presentations, e-mail, and simple web pages can help you get your feet wet. However, if you get more involved in the process, then you need to re-examine the needs of your students and the objectives of the course. How can student web pages, collaborative work groups, class bulletin boards and chat areas improve the learning that takes place under your direction? Can collaboration advance beyond your class to include all interested students at your university? The Internet allows such discussion to take place with a world-wide audience. Explore the possibilities and do your best to make them realities. By asking these questions, the faculty member can take sure steps into the information age.

Of course, we aren't all new to technology. For the information systems manager, the challenge is making meaningful workshops available at times faculty can use them. It means making the resources available. It means making some sort of help, whether it is faculty peer help, staff assistance, on-line help, or student help desks available to faculty and staff. Some faculty will develop their skills writing HTML, some will do fine with applications such as PageMill, and others

[17]http://130.111.175.15/Home/Page2Stage/215.html

[18]Batson and Bass, pp. 44-45.

will need to have their pages made for them. The assistance can't just be technical: many faculty may need help with constructing effective teaching strategies that use technologies. The educational ideal of carefully considering our methods and their efects in the classromm may become more vital then ever when we condier the vast array of possibilities open to us and our students.

Change is constant and technology is integral to it. Some of us have rushed toward it. Many others are waiting to see results. Other still are resisting change as firmly as possible. Easing into the 21st century will involve a program of instruction, individual innovation, and a total effort that crosses disciplines and job descriptions.

Bibliography

Aukstakalnis, Steven and Mott, Wm. Michael. "Transforming Teaching and Learning through Visualization." *Syllabus*, 9, no. 6 (March 1996), 14-16.

Batson, Trent and Bass, Randy. "Teaching Learning in the Computer Age." *Change*, 28, no. 2 (March/April 1996), 42-47.

Fox, Louis and Sharpe, Kathryn. "UWired: Drivers' Ed for the Information Highway." *Educators' Technology Exchange* 3, no. 2 (Fall 1995), 18-24.

Gilbert, Steve. "Making the Most of a Slow Revolution." *Change*, 28, no. 2 (March/April 1996), 10-23.

Goodman, Danny. "Education and the Internet: The Coming Challenge to Internet Culture." *Syllabus* 9, no, 3 (November/December 1995), 10-12.

Green, Kenneth. "The Coming Ubiquity of Information Technology." *Change*, 28, no. 2 (March/April 1996), 24-28.

Johnstrone, Sally M. and Krauth, Barbara. "The Virtual University: Principles of Good Practice." *Change*, 28, no. 2 (March/April 1996), 38-41.

Rutherford, LeAnne H, and Grana, Sheryl J. "Retrofitting Academe: Adapting Faculty Attitudes and Practices to Technology." *Technological Horizons in Education Journal*, 23, no. 2 (September 1995), 82-86.

Presenters Index

Ernest C. Ackermann	Mary Washington College	24
John A. Anderson	Loras College	10
Stephen T. Anderson Sr.	University of South Carolina Sumter	9, 18
David J. Ayersman	Mary Washington College	24
Kurt E. Bernardo	Lake Erie College	31
Kim Breighner	Gettysburg College	204
Kate Coffield	American University in Cairo	34
Mary V. Connolly	Saint Mary's College	41
William J. Creighton	Indiana University of PA	100
Daniel Faulk	Washington and Jefferson College	100
Bob Fernekes	University of South Carolina - Aiken	45
David Field	DePauw University	49
Peter R. Giuliani	Franklin University	53
Margaret W. Groman	State University of New York - Oswego	61
Tim Hagopian	Worcester State College	66
J.Timothy Kolosick	The University of Arizona	146
Arthur W. Hafner	College of Staten Island	110
Pat Halpin	State University of New York- Oswego	76
Mary Hanna	Metropolitan State College of Denver	82
Brian R. Hoyt	Ohio University-Lancaster	88
Janet Hurn	Miami University	191
Frederick Jenny	Grove City College	100
Harold H. Kollmeier	Franklin Pierce College	106
Joanne D. Kossegi	State University of New York- Oswego	76
Michael E. Kress	College of Staten Island	110
Albert L. LeDuc		7
Susan V. Monk	Penn State Berks	114
Bonnie M. Nealon	DePauw University	136
Thomas A. Pollack	Duquesne University	124
J. Stuart Shough	University of South Carolina at Spartanburg	131

Carol L. Smith	DePauw University	136
Karen L. Smith	The University of Arizona	146
Peter D. Smith	Saint Mary's College	158
Michelle Snyder	Lord Fairfax Community College	168
Robin M. Snyder	Shenandoah University	174, 181
Nancy Thibeault	Miami University	191
Nancy S. Thomson	Northwest Missouri State University	197
Robin Wagner	Gettysburg College	204
Brad Weaver	Wabash College	209
John Weber	Southern Arkansas University	217
Morris Weinstock		8
Arthur E. Williams	University of Maine at Machias	223
William Wilson & Martha Arterberry		8
Mike Zastrocky		7
Paul M. Zisman	Mary Washington College	24